THE AMERICAN NEPTUNE

A QUARTERLY JOURNAL OF MARITIME HISTORY

Volume XLIX, No. 2 Spring 1989

Vol. XLIX, No. 2, 1989 ISSN 0003-0155

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Subscriptions are accepted only for complete volumes, which coincide with the calendar year. In return for subscriptions received after the beginning of the year, subscribers will receive the numbers that have already appeared in the current volume, as well as the numbers that will be published during the remainder of the year. Single copies are $8.50 each in 1989. Certain complete volumes of back issues are available although in cases where the supply is greatly reduced some numbers are sold only as parts of complete volumes.

The editors of THE AMERICAN NEPTUNE assume editorial responsibility, but they and the Peabody Museum of Salem do not necessarily endorse the opinions expressed by authors. *Notes for Contributors* to THE AMERICAN NEPTUNE, a style manual for manuscript preparation, will be sent upon request to prospective contributors.

The American Neptune (ISSN 0003-0155) is published quarterly at $32.00 per year for domestic subscribers, $35.00 per year for foreign subscribers and $8.50 per single issue by the Peabody Museum of Salem, 161 Essex Street, East India Square, Salem, Massachusetts 01970. Subscriptions should be addressed to *The American Neptune*, and manuscripts, books for listing and correspondence should be addressed to the Editor. Second-class postage is paid at Salem, Massachusetts, and at additional mailing offices. POSTMASTER: Send address changes to The American Neptune, Peabody Museum of Salem, Museum Shop, 161 Essex Street, East India Square, Salem, Massachusetts 01970.

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Volume XLIX, No. 2

Spring 1989

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SALEM, MASSACHUSETTS

PUBLISHED BY THE PEABODY MUSEUM OF SALEM, MASSACHUSETTS

HEFFERNAN PRESS INC., WORCESTER, MASSACHUSETTS

PRINTED IN THE UNITED STATES OF AMERICA

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EDITOR'S COMMENTS

THIS issue of Neptune is almost entirely concerned with the American maritime scene. It begins with William Stuart Morgan's article *The Commerce of a Southern Port: New Bern, North Carolina, 1783 to 1789*. We know a great deal about the commerce of major ports like Baltimore and Charleston during this early Federal period, but little about what was happening in smaller maritime centers in between, like New Bern. Hence we welcome the author's careful reconstruction of the activities of one such port.

Next we have David Syrett's *H.M. Storeship* Porpoise *1780-83*. This should interest naval historians because all too often we pay little attention to how eighteenth century navies made use of storeships to supply their fleets overseas. The story of *Porpoise* then should help to fill this need and enable us to understand that navies like armies in the final analysis travel on their stomachs.

This is followed by a long account of the career of the *U.S. Navy Steam Sloop* Princeton, by Spencer C. Tucker. I must say that as a Princetonian myself, I welcome an account of the first such navy ship to bear this illustrious name. But more important is the fact that this vessel shows what can happen when the forward-looking ideas of a naval designer like John Ericson collide with political realities embodied in the person of Captain (later Commander) Robert Stockton. The resulting accident that befell *Princeton* when one of its great guns exploded, set back for some time both Ericson's career and the development of steam vessels by the American Navy.

We then turn to Dean C. Allard's *Naval Technology During the American Civil War*. This article explains in some detail how both the Union and Confederate naval establishments made use of available technology during this bitter struggle. It also makes it very clear why the technology which was tested by both sides had less effect than one would expect on the world naval scene.

Next we find an account of a mid-nineteenth century shipwreck in the nearby Bahamas in a piece entitled *A Grounding in the Bahamas in 1851*, by Frank B. Evans III. This should interest those who are aware of how few *detailed* accounts we have of such maritime mishaps during this great age of sail.

Following this piece, we have a long review article by the editor which is concerned with a recent important book on the Mediterranean in medieval and early modern times. It is to be hoped that this will help to clarify the present status of studies concerning the maritime history of the Middle Sea during a crucial period of its history.

We then close with a number of other book reviews and a listing of the winners of our first annual Francis B. Lothrop award. We hope that these awards will encourage the submission of more such excellent articles to the *Neptune* in future years.

ARCHIBALD R. LEWIS

Salem, Massachusetts

The Commerce of a Southern Port; New Bern, North Carolina, 1783 to 1789

WILLIAM STUART MORGAN III

". . . there are very few planters who do not live within ten miles of some water where ships may float . . ."

". . . we can build and navigate our own ships . . ."

NEW BERN, located at the confluence of the Neuse and Trent rivers, was an important North Carolina port between the end of the War of the American Revolution (1783) and the adoption of the Federal Constitution (1789).* North Carolinians living near navigable waters of the two rivers produced goods needed elsewhere along the Atlantic coast, in the Caribbean, the Bermuda Islands and in England; so, they utilized the port to ship and receive goods. Taken from a 1791 issue of New Bern's *North Carolina Gazette*, both quotes above emphasize that ships could navigate North Carolina's rivers and sounds, that water was accessible for transportation, and that North Carolinians could build and navigate their own ships.[1]

New Bern, located in the center of Eastern North Carolina between Edenton (northeast) and Wilmington (southeast), was founded in 1710 by Swiss, Germans and English. The town soon became the most important settlement and commercial center in the area.[2] In fact, the North Carolina General Assembly passed a series of acts by 1739 to aid navigation between New Bern and Ocracoke Inlet, the port's principal passageway through the Outer Banks. Navigation aids were set-up through Ocracoke Inlet, and a system of pilotage was established. Shipmasters sailing to New Bern were charged a six pence for every foot of water their vessel drew, and funds collected were used to improve navigation.[3] Six years later, the General Assembly ordered road commissioners to open and maintain landings along the Neuse and Trent to facilitate trade with the many farms and plantations surrounding the town.[4]

New Bern has always been the county seat of Craven County. By 1790, Craven had a population of 10,469 (including 3,658 slaves), making it one of the most populated counties in Eastern North Carolina.*[5]

* Treasury Department to the United States House of Representatives, "Abstract of the Tonnage of the Shipping of the last day of December, 1794," *Commerce and Navigation Records*, Vol. 1, House Document 30, 4th Congress, 1st Session, 1796, p. 332. Edenton, Wilmington and New Bern were the three leading North Carolina ports, followed by Washington (N.C.) and Camden. The registered, enrolled and licensed tonnage and total tonnage for the state's ports were first reported in this source in 1794:

NORTH CAROLINA

Port Districts	*Registered*	*Enrolled and Licensed*	*Total*
Edenton	4,098	1,573	5,671
Wilmington	4,,076	1,331	5,407
New Bern	2,676	983	3,659
Washington	2,772	748	3,520
Camden	817	1,501	2,318

Some historians, including harry R. Merrens, Hugh T. Lefler, Albert R. Newsome, Charles C. Crittenden and Alonzo T. Dill, have discussed topics that affected the development of New Bern as a port. The author of this article discussed the Port of New Bern from 1783 to 1789 in the second chapter of his master's thesis, "The Commerce of a Southern Port, New Bern, North Carolina, 1783 to 1789," but has revised his study of the port by incorporating additional material not used in his thesis.

1. The *North Carolina Gazette* (New Bern), 24 September 1791.

2. *Christopher Von Graffenreid's Account of the Founding of New Bern* (Raleigh, N.C.: Edwards and Broughton Printing Co., 1920), p. 261.

3. William L. Saunders, comp., *The Colonial and State Records of North Carolina*, 4 (Raleigh, N.C.: The State of North Carolina, 1886 to 1890), p. 506.

4. Walter Clark, *The State Records of North Carolina*, 23 (Winston and Goldsboro, N.C.: The State of North Carolina, 1895 to 1907), p. 223.

5. United States Census of 1790, *Return of the Whole Number of Persons within the United States* (Philadelphia, Penn.: Childs and Swaine, 1791), pp. 3, 52-53. According to this first census, North Carolina had a population of 393,751 in 1790, of which 100,572 were

New Bern was also the capital of North Carolina from 1765 to 1791.[6] In fact, commerce at the port had increased so much that a law was passed in 1765 to establish and regulate a marketplace in the open space directly beneath the town's courthouse and on surrounding grounds.[7] By 1775, a network of roads connected New Bern with other areas of North Carolina, Virginia and South Carolina. Toll bridges and public ferries* permitted carts, carriages and wagons to transport goods across streams and rivers to New Bern's marketplace and to at least ten wharves on the town's waterfront.[8]

New Bern was an active port by the end of the war. From 1783 to 1789, the North Carolina General Assembly passed a number of important maritime regulations to facilitate the trade of New Bern and other North Carolina ports. The Assembly appointed officials to make the state's treacherously shallow waterways safe for navigation, to regulate the state's shipping and to periodically examine the Swash at Ocracoke Inlet. The Assembly regulated pilotage, and appointed officers to keep the Swash "and all other channels leading from Occacock Bar to Washington, Edenton and Newbern [former spelling], well and sufficiently staked out, and to erect Beacons at Occacock, Beacon-Island, Core Banks, and all other such Places" for the safety of vessels.[9] The General Assembly appointed collectors at the state's ports, and defined the responsibilities of the ports' naval officers, customs officers and shipmasters.

The Assembly said Commissioners of Navigation at North Carolina ports could examine "Pilots touching their Qualifications, and upon their Approbation to grant them a Certificate or Certificates to pilot Vessels in all or any of the respective Ports aforesaid."[10] Slaves could be certified as pilots if they passed the examination, and if their masters presented "bond with good security."[11] Pilots, guiding vessels from the outside of the Ocracoke Bar inward to Beacon-Island Road just within the inlet, collected

> two Shillings Specie per Foot, for every Vessel that draws nine Feet Water or Less; and for every Ship or Vessel that draws more than nine and less than ten Feet Water, two Shillings and six Pence Specie per Foot; and for every Vessel drawing ten Feet Water and upwards, three Shillings Specie per Foot; and that the same Sums be allowed to Pilots for Pilotage outwards as inwards.[12]

If pilots boarded incoming vessels, and such vessels were "drove off the coast" by "contrary winds," they were to be paid "three Shillings and six Pence Specie per Day, for each and every Day he shall be on Board the said Vessel, over and above his pilotage."[13] The General Assembly saw to it that pilots were paid fairly for their services, but at the same time protected shipmasters from unreliable and unscrupulous pilots. Pilots, who neglected or refused to assist vessels after they had been signalled for help, were fined. Pilots, who demanded or exacted higher fees than authorized, were also fined. As of 1783, pilots guiding vessels from Beacon-Island Road to New Bern, collected "for every Vessel that draws six Feet Water or less . . . thirty-six Shillings Specie; for every Vessel drawing

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slaves. Of the sixteen federal districts reported that year in the U.S. census, North Carolina ranked third in population, behind only Virginia and Pennsylvania. After Virginia and Maryland, North Carolina also possessed the greatest number of slaves. Alonzo T. Dill, "Political and Commercial Rise of New Bern," *The North Carolina Historical Review*, 23 (January 1946), pp. 51-52, 54; and William S. Powell, ed., "Tyron's 'Book' on North Carolina," *The North Carolina Historical Review* 34 (July 1957), p. 411. According to Powell, Tryon's 'Book' is a forty-four page manuscript letter written on 26 July 1765 from Brunswick by Governor William Tryon of North Carolina to his uncle, Sewallis Shirley. Gov. Tryon, in this manuscript, said that "The Negroes are very numerous five to one White Person in the Maritime Counties, but as you penetrate into the Country few Blacks are employed, merely for this Simple reason, that the poorer Settlers coming from the Northern Colonies sat themselves down in the back Counties where the land is the best but who have not more than a sufficiency to erect a Log House for their families and procure a few Tools to get a little Corn in the ground.

6. Dill, "Political and Commercial Rise of New Bern," 23 (January 1946), pp. 51, 52 and 54. Raleigh became the capital of North Carolina after New Bern.

7. D. L. Corbitt, ed., "Historical Notes," *The North Carolina Historical Review* 6 (October 1929), pp. 417 to 418.

8. James Iredell, *Laws of the State of North-Carolina* (Edenton, N.C.: Hodge & Wills, Printers to the State of North-Carolina, 1791), 22 October 1784, New Bern, N.C., chp. 14, pp. 533 to 536. The North Carolina General Assembly enacted legislation, regulating the construction and requiring the maintenance of public roads within the state; Henry Mouzon, *An Accurate Map of North and South Carolina* (Reproduced by W. P. Cumming, North Carolina in Maps. Raleigh, N.C.: North Carolina Division of Archives and History, 1966), plate B; C. J. Sauthier, *Plan of the Town of Newbern in Craven County North Carolina, May 1769* (Ithaca, N.Y.: Reproduced in 1971 by Historic Urban Plans from a manuscript in the Map Room of the British Museum.); and *A Plan of the Town of New Bern and borough With the Lands adjoining Contained within the bounds of the Original Grant to Dan.l Richardson in 1713, ca. 1816* (Raleigh, N.C.: North Carolina Division of Archives and History, Raleigh, N.C.).

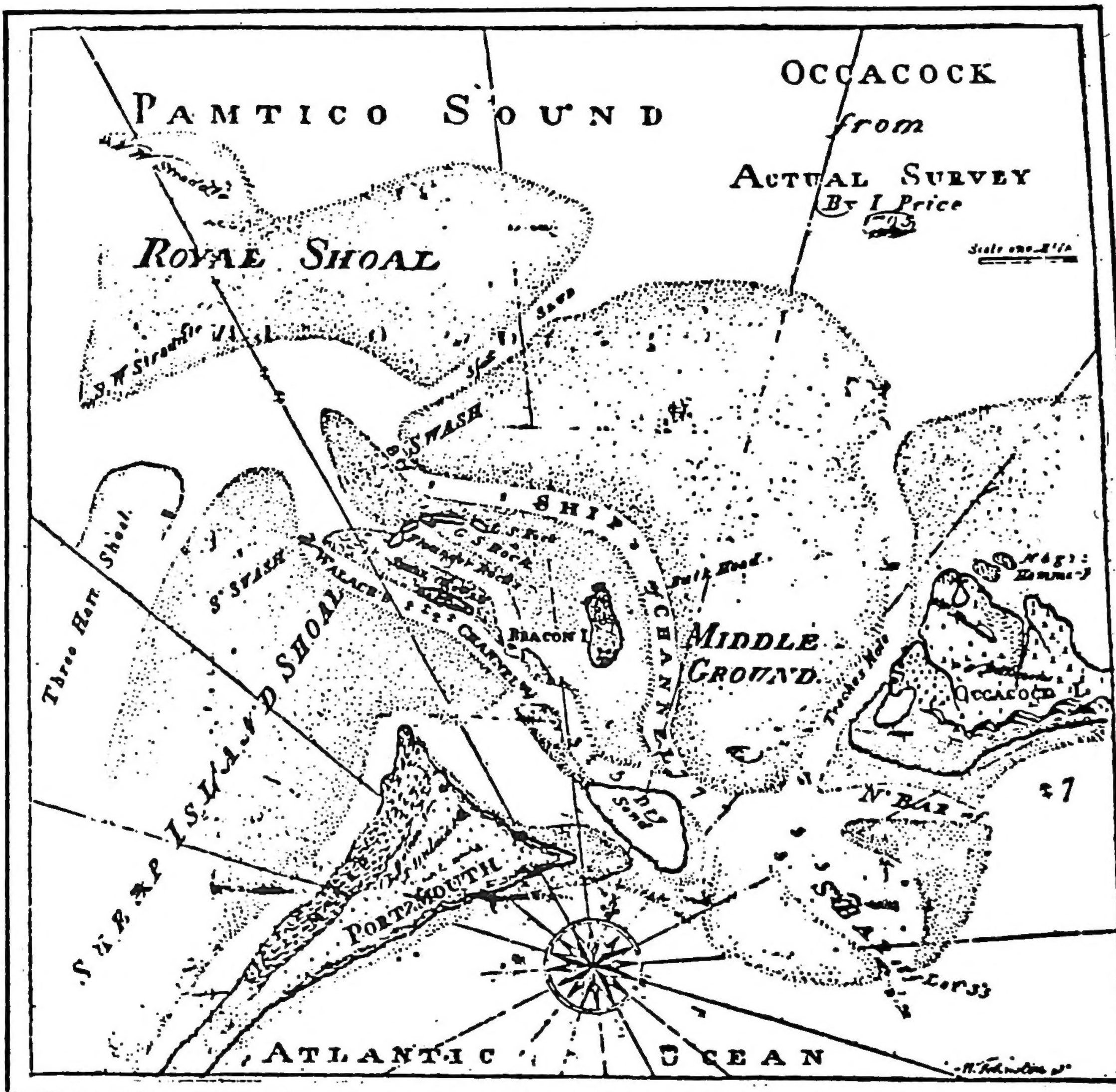
9. Iredell, *Laws of the State of North-Carolina,* 18 April 1783, Hillsborough, N.C., chp. 20, p. 464.

10. *Ibid.*

11. *Ibid.*

12. *Ibid.*

13. *Ibid.*



"Occacock from Actual Survey," 1795. By Jonathan Price. *A Description of Occacock Inlet* (New Bern: Francois-X Martin, 1795). Reprint edition, D. L. Corbitt, ed. *The North Carolina Historical Review*. 3 (October 1926): 633.

six Feet Water, seven Shillings Specie per Foot." But as of 1784, they collected "for every Vessel from Beacon-Island Road that draws six feet Water or less to Newbern forty Shillings, and for every Vessel that draws above six Feet seven Shillings and six Pence per Foot."[14]

14. Iredell, *Laws of the State of North-Carolina*, 18 April 1783, chp. 20, pp. 464 & 465; and chp. 28, p. 505.

North Carolina waterways are shallow compared to those of other areas along the Atlantic coast. The General Assembly, recognizing the shoal nature of Ocracoke Inlet and many of the state's shipping channels as early as 1783, tried to keep the situation from becoming worse when it ordered that

> no Master or other Persons belonging to any Vessel trading to this State shall cast or throw overboard into any Channel or Rivers within this State, any Stones or other Ballast whatsoever, any Oysters or Oyster-Shells, under the Penalty of one hundred Pounds Specie for every such Offence.[15]

Beacons, stakes and other markers within the state's waterways were considered so important that fines of "fifty Pounds Specie" were also levied—for each offence—against anyone who intentionally pulled-down such aids to navigation.[16]

A quarantine law was passed in 1783 because vessels occasionally sailed into North Carolina waters with small pox and other diseases. The law required shipmasters and pilots onboard infected vessels to immediately notify Commissioners of Navigation of such diseases at any port they entered. The commissioners, in turn, ordered the shipmaster to quarantine his vessel at the port for as many days as they considered necessary. Pilots and shipmasters were fined 50 pounds specie and 100 pounds specie, respectively, if they did not notify commissioners. And shipmasters were charged 500 pounds if they failed to comply with the commissioners' quarantine order.[17]

The first section of the law, regulating North Carolina's customs officers in 1784, stated that it was necessary to appoint such officials due to the state's "increased and increasing trade," and explained that customs officers had to be regulated to encourage commerce and to acquaint the state legislature "from time to time with certainty of the value and quantity of the imports and exports of this State."[18] The law also stated that collectors for North Carolina's ports "shall be chosen by the General Assembly by joint ballot of both houses, and commissioned by the Governor."[19] Collectors and naval officers, appointed to North Carolina's ports, were each required to present a bond of 5,000 pounds "current money" to the North Carolina governor. They also took the following oath:

> I, _____, do truly discharge the duty _____ for the port _____ according to law, and to the best of my skill and judgment, and that I will not during my continuance in the said office be concerned directly or indirectly in exporting any goods, wares and merchandize, which are liable to the payment of any duty or impost except for my own particular use and consumption not exceeding the value of two hundred pounds sterling in any one year. SO HELP ME GOD.[20]

A shipmaster reported to a naval officer or his deputy at a North Carolina port within forty-eight hours after he entered any inlet or port in the state, and then delivered his ship's register and cargo manifest. Next, the naval officer administered the following oath or affirmation to the shipmaster:

> I, _____, master of the vessel called the _____, do swear or affirm, that I will make diligent enquiry and search in my said vessel for concealed persons of whatever denomination, degree or condition; and that I will not wittingly or willingly carry, or suffer to be carried therein out of this State, or to be taken on board thereof after my departure therefrom, without such pass or certificate as is required by law, any person or persons whatsoever inhabitants of the said State; nor will I carry or suffer to be carried or received as aforesaid, any servant or slave that is not attending his or her master or mistress, unless such servant or slave shall be sent to be transported by such master, mistress, or some other person having authority, for some special purpose. SO HELP ME GOD.[21]

Fees for services performed by the ports' naval officers were:

For Entering and Clearing Vessels Engaged in Interstate and/or International Trade

Vessels and boats not decked	8 shillings
Decked vessels under twenty tons	15 shillings
Decked vessels, 20 to 59 tons	30 shillings
Decked vessels, 60 tons or more	40 shillings

The officer collected half of the above charges when vessels entered, and the other half when they cleared. But the officer applied only half of the charges to vessels that traded strictly within the state.[22]

15. Iredell, *Laws of the State of North-Carolina,* 18 April 1783, chp. 20, p. 466.

16. *Ibid.*

17. Iredell, *Laws of the State of North-Carolina,* 18 April 1783, chp. 20, p. 467.

18. Walter Clark, ed., *The State Records of North Carolina,* 24 (Winston and Goldsboro, N.C.: The State of North Carolina, 1895-1907), pp. 543, 553.

19. Clark, *State Records,* 24:553.

20. Clark, *State Records,* 24:553. The £5,000 bond was payable to the Governor and lodged in the secretary's office during the appointment of collectors and naval officers. If and when a collector or naval officer was found guilty of unfaithful service, the bond was used by the party or parties that filed suit.

21. Clark, *State Records,* 24:553.

22. Clark, *State Records,* 24:554.

A portion of Eastern North Carolina Showing "New Berne" in Craven County (Center), from Henry Mouzon's Map of North and South Carolina, 1775. Reprint edition by W. P. Cumming. *North Carolina in Maps*. (Raleigh: North Carolina Division of Archives and History, 1966). Plate 8.

Naval officers and collectors displayed "in the most public place in their respective offices, and constantly keep the same so set up, three fair tables or copies of the fees allowed by this Act, that is to say, one in English, one in French, and one in the Dutch Language."[23] They provided tables of import duties, the tonnage duties to be paid when shipping, and receipts for all duties that had been paid. These officials recorded imports and exports, and periodically forwarded such records to North Carolina's governor for review. In order to assess duties, naval officers and collectors used the following formula to calculate a vessel's tonnage: length of gun deck, deducting three-fifths of the greatest breadth from outside to outside; multiplied by breadth from out to out; multiplied by half the breadth; divided by 94.

A vessel could not clear a North Carolina port before the shipmaster presented his ship's cargo manifest to the port's naval officer, or before a certificate had been received from the port's collector acknowledging that import and tonnage duties had also been paid. A shipmaster also had to take an oath or affirm that the

23. Clark, *State Records*, 24:555.

products he was exporting had been inspected and loaded legally.[24]

The North Carolina General Assembly passed laws in 1784 and 1789 requiring counties to appoint one or more persons in January of each year to serve as inspectors. These officials, serving one-year terms, inspected all products* before exportation. New Bern and landings at Clubfoot's Creek, Low Creek or Broad Creek, Swift Creek and Harris's Landing or Ferry (all within Craven County) were designated as inspection stations. Once inspected, casks and barrels were branded with the name of the inspector and his place of residence. Regulations were provided governing the construction and packaging of casks and barrels, the kinds of goods, and the quantities of products that each container could carry.[25]

North Carolinians wanted to improve the state's rivers so that they could be used to transport goods by water more safely and efficiently. Therefore, the state government passed laws as early as 1784 to dredge the Neuse and Trent rivers, flowing north and south of New Bern and eastward into Pamlico Sound.[26] One regulation required that the justices of the courts of Craven, Dobbs, Johnston and Wayne counties facilitate navigation of the Neuse River for small vessels by apportioning and laying-off

> in convenient districts all the inhabitants of their counties respectively, resident within eight miles of the Neuse River, and above Batchelor's creek on the south side of the Neuse river, and above the mouth of Swift's creek on the north side thereof, and appoint for each district some person properly qualified as overseer.[27]

Overseers forced everyone within their districts to work at least six days every year on the Neuse River. Workers, under the direction of the overseers, cut into proper lengths all logs, removed brush and other incumbrances obstructing the navigation of that river.[28] Another regulation required the clearing of the Trent River for navigation, but only through territory within Jones County. The regulation was similar to the one that facilitated navigation of the Neuse River, but went a step further by requiring workers within eight miles of the Trent River to "continue to work from time to time whenever the commissioners shall think it necessary."[29] The law stated that in order to keep open the navigation of the Trent, any person that

> shall fall any trees or make any hedges in or across said river, shall forfeit and pay for every such offense, being thereof convicted before any justice of the peace of said county the sum of five pounds current money, and remove the obstruction at their own expense.[30]

Two laws were passed by the General Assembly of North Carolina in 1789; one stated that "a Light-House on Ocacock Island would tend greatly to the Safety of Vessels bound over Ocacock Bar, and very much encourage Foreigners as well as Citizens of the United States to trade with this state." Ocracoke Inlet was New Bern's primary passageway through the Outer Banks, but the Swash just inside the inlet was a major obstacle to the port's trade between 1783 and 1789. Vessels had to be small enough to sail safely through the treacherous passageway, and another 70 miles of water between that inlet and the Port of New Bern.[31]

A Description of Occacock Inlet, published in 1795, described the inlet, and its "COASTS, ISLANDS, SHOALS, AND ANCHORAGES and DISTANCES to and from the most Remarkable Places, And DIRECTIONS to sail over the BAR and thro' the CHANNELS."[32] Right from the beginning of the

24. *Ibid.*

25. Iredell, *Laws of the State of North-Carolina,* 19 April 1783, Hillsborough, N.C., chp. 26, pp. 494, 495, 497. Specifically, the officials inspected beef, pork, rice, tar, pitch and turpentine, staves and headings, fish, flour, butter, flax seed, sawed lumber and shingles before exportation.; 22 October 1784, New Bern, N.C., chp. 5, p. 521; 2 November 1789, Fayetteville, N.C., chps. 16 to 18, pp. 670 to 672. The General Assembly regulated the inspection of tobacco in 1789. Inspectors at warehouses, including those at New Bern, checked tobacco to determine whether it was thick, well-cured and in good condition. They branded a heading and the side of each hogshead containing tobacco with "A," "B" or "C" depending on whether the product was first, second or third class. Inspectors branded tobacco hogsheads with other marks, including the weight of the tobacco shipped within each; and chp. 34, p. 681. The inspection of flax seed was determined to be an unnecessary expense to the shipper, and was no longer required as of 1789.

26. Charles C. Crittenden, "Inland Navigation in North Carolina, 1763 to 1789," *The North Carolina Historical Review,* 7 (April 1931), pp. 145 to 154. Crittenden said acts were also passed in 1784 to clear the Roanoke and Tar rivers, and added that a company was chartered in 1788 to open—as far as practicable—both branches of the Catawba; and Clark, *State Records,* 24:602-603.

27. Clark, *State Records,* 24:602.

28. *Ibid.*

29. *Ibid.*

30. Clark, *State Records,* 24:603.

31. Iredell, *Laws of the State of North Carolina,* 2 November 1789, Fayetteville, N.C., 2 November 1789, chp. 58, pp. 688 & 689.

32. Jonathan Price, *A Description of Occacock Inlet* (New Bern: Francois-X Martin, 1795), reprint ed., D. L. Corbitt, ed., "Historical Notes," *The North Carolina Historical Review* 3 (October 1926),

guide, the importance of Ocracoke Inlet is emphasized:

> Occacock Inlet lies in thirty-five degrees and five minutes, north latitude. It is the only one through the Outer Banks which admits vessels of any burden, bound to any of the ports of entry or delivery of the State of North Carolina, excepting those of Cape-Fear river and those of Beaufort and Swansboro.
>
> It opens, between Occacock and Core banks, into Pamlico sound—a kind of inland sea, about one hundred miles in length and from twenty to thirty in breadth, receiving with Albemarle sound, which joins it to the north, the waters of most of the rivers that run through the state.[33]

The guide directed shipmasters through the inlet, and described some of the problems that they would face when sailing through it.

> After sailing over either of the bars, vessels of burthen, whether they be bound to Neuse, Pamtico [former spelling of Pamlico] or Roanoke river, or any part of Albemarle sound, pass through Ship Channel or Wallace's Channel. Small vessels, bound for Albemarle sound, drawing less Than six feet of water, may pass through Teache's Hole, which is a small channel running on the west side of Occacock, about a half a mile in breadth.
>
> Ship Channel runs between a large shoal called the Middle Ground, and a smaller one called Beacon Island Shoal. The water from the outside of the bar near the middle of this channel is from four to seven fathoms deep. Here is a spot called the Bulk Head, on which there is only ten feet of water: after which the water deepens again to three fathoms, until the Swash [very shallow area] at the end of the channel, where there are eight feet and one half of water.[34]

The Swash was said to be so shallow that "no vessel of Burthen can pass it until they discharge Cargo, and can only return again half loaded, & have the Remainder sent down in Lighters, Sloops or Periaugers [Perriaugers]."[35] An unidentified French traveller, passing through New Bern in 1765, said that vessels of 200 tons burden could sail close to New Bern when loaded, but stressed that the water was only nine feet deep. He added that "when vessels Draw more than this quantity, they are obliged to lighten into flats and take in their goods when they are over the swash."[36] Lighterage of a percentage or an entire cargo from larger to smaller vessels when entering, and from smaller to larger vessels when exiting the inlet, was a common procedure and a significant disadvantage for the Port of New Bern. Lighterage fees, an additional expense for shippers, raised the price of products shipped in and out of New Bern and other ports utilizing Ocracoke Inlet. Shipping merchant Richard Blackledge of Washington, on the Pamlico River, "Straniously urge[d]" Mr. Anderson in 1786 "to Sell the Ship [*Fanny*], or to put her into Some other trade, as you [John Anderson] may rely a Vessell her Draft of Water is much agt. the freighter, lighterage being so very high from the Country to the Barr."[37] But lighterage costs at Ocracoke Inlet were not the only problems that shipmasters encountered there. When shipmasters had to have their cargoes lightered, the time-consuming procedure also caused the "most tedious delays and the running away of Seamen from a ship . . . ," seamen who could not be easily replaced.[38] It is possible, given the foregoing statement, that slaves were employed on North Carolina vessels. Considering the remote, isolated nature of the inlet, few seamen—except those who were enslaved—would elect to run

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pp. 624, 627 to 628, 633. Although Ocracoke Inlet probably had a low-water depth of thirteen to fourteen feet, the Swash at the end of the channel had only eight and one half feet of water.; Charles C. Crittenden, *The Commerce of North Carolina, 1763 to 1789* (Chapel Hill, N.C.: The University of North Carolina Press, 1973), p. 4. According to Crittenden, the spelling of Ocracoke varied throughout the 1700s, i.e., Occacock, Ocacock, etc.; The *North Carolina Gazette* (New Bern) 13 February 1796. According to this issue, a few copies of *A Description of Occacock Inlet* could be purchased for fifty cents each at New BAern's printing office and from William Johnston.

33. Price, *Occacock Inlet*, p. 625.

34. Price, *Occacock Inlet*, pp. 627 to 628. According to *A Description of Occacock Inlet*, small vessels bound for the Albemarle—after sailing through Ship Channel—could pass between The Middle Ground (a shoal) and the Royal Shoal. These small vessels could then pass through a smaller channel called the Five Feet Slue (Sluice), named for its depth.

35. William L. Saunders, comp., *The Colonial and State Records of North Carolina* 5 (Raleigh, N.C.: The State of North Carolina, 1886 to 1890), p. 316; and Crittenden, *The Commerce of North Carolina*, p. 5. A "perriauger," the archaeic variant of "piragua," was a two-masted, flat-bottomed boat, undecked at both ends, or a canoe made of a hollowed-out tree trunk.

36. Crittenden, *The Commerce of North Carolina*, pp. 4 to 5; Clark, *The State Records of North Carolina* 23:667 and 668; and J. Franklin Jameson, ed., "Journal of a French Traveller," Part 1, *The American Historical Review* 26 (July 1921), p. 735; and Price, *Occacock Inlet*, pp. 629 to 630.

37. Any small vessel employed in lightering goods, regardless of its specification, was called a "lighter." A lighter, more narrowly defined, was a large, usually flat-bottomed boat or barge that was mainly used in unloading or loading ships not lying at wharves or in transporting freight around a harbor. Lighters and lighterage charges are mentioned throughout the handwritten ledgers, journals and disbursement book of the William Hollister Shipping Company, New Bern, North Carolina, William and William Hollister, Jr., Collection, North Carolina Division of Archives and History, Raleigh, N.C.; Richard Blackledge to John Anderson, 16 January 1786, "Richard Blackledge Letterbook, 1 March 1782 to 30 June 1787," May Gordon Latham Kellenberger Foundation, New Bern, N.C.

38. Richard Blackledge to John Anderson, 16 January 1786, "Richard Blackledge Letterbook."

away at that location. While many shipmasters commanding large vessels often encountered lighterage costs when shipping goods to and from New Bern, some shipmasters commanding larger vessels avoided lighterage fees altogether; instead of sailing through the Swash at Ocracoke Inlet, they met small boats at Beacon Island Road just within Ocracoke Bar to trade cargoes.[39]

Six years after North Carolina's quarantine law was enacted, the state's ports were required to support sick seamen. A shilling was required to be collected in 1789 from each shipmaster, mate and crewmember when entering each port. Diseases were thought to usually be brought in by vessels from foreign places, so shipmasters arriving at North Carolina ports from long voyages paid the aforementioned charges and the following: "the Sum of one Shilling per Month, and the Sum of four Pence per Month for each of his Crew . . . for each Month it may have been since he left the Port of his Departure." Only shipmasters, mates and seamen of vessels arriving on long voyages, who could show receipts for hospital money paid at another United States port within the preceding month, were excluded from such payment within North Carolina.[40]

North Carolina rivers flow west to east and northwest to southeast. While none of them can be easily navigated deep into the state's interior, small vessels entered and cleared the state's ports during the eighteenth and nineteenth centuries. Areas around Albemarle Sound (northeast), along the Cape Fear River (southeast), and to a lesser degree near the Pamlico and Neuse rivers (mid-coastal), were separated geographically. It was relatively easy to navigate within one of the regions, but more difficult to sail between two of them.[41] Consequently, few commercial contacts existed between these three areas of North Carolina.

The letterbook of Richard Blackledge (the shipping merchant in Washington, N.C., mentioned earlier) which he maintained from 1 March 1782 to 30 June 1787, demonstrates the trade that did exist within the mid-coastal region. Richard Blackledge corresponded with other North Carolina merchants and businessmen at ports north and south along the Atlantic Seaboard, and at ports in the West Indies and in Europe, particularly Great Britain. Blackledge's correspondence provides some understanding of his business affairs, and those of a New Bern shipping merchant named Spyers Singleton.[42]

Richard Blackledge worked as a merchant in Washington on the Pamlico River (flowing north to east, just north of New Bern) for about four years before he and Singleton became business partners on 5 June 1784 with two British merchants, Patrick Dougall of Glasgow, Scotland and John W. Killar of Bristol, Great Britain.[43] The new firm, which shipped goods directly between North Carolina and England and other European countries, was called "Blackledge, Singleton & Company."

Blackledge said in the letter to Patrick Dougall that "in full Confidence of each Other & reciprocal advantages We [Richard Blackledge and John W. Killar] Expect from it agreed to enter into partnership for One year." Blackledge then informed Dougall that Killar had named him (Dougall) to be "One fourth Concern'd if agreeable," and added that if the partnership succeeded for one year, it could continue "during pleasure."[44] Business was conducted both in Europe and America—free of the shippers' commissions—and the company's profits or losses were equally shared.[45] Both stores usually received equal quantities of goods, and packages were marked with company seals B&S for each of the two stores to prevent confusion during shipments.

In a letter on 5 June 1784, which provided details of the partnership, Blackledge said he and others wished that:

> every possible dispatch [be] given to the Brig young in your power with the goods that can be first Commanded & then as large a Vessell as can be Conveniently had on Charter that when Loaded will not Draw more than Twelve feet Water to be taken up & sent to hand with every Convenient Dispatch

39. Crittenden, *The Commerce of North Carolina*, p. 5.

40. Iredell, *Laws of the State of North Carolina*, 2 November 1789, Fayetteville, N.C., chp. 60, p. 690.

41. Crittenden, "Inland Navigation in North Carolina," pp. 153 & 154.

42. Crittenden, "Inland Navigation in North Carolina," pp. 153-154; "Richard Blackledge Letterbook"; and Attmore, "Journal of a Tour of North Carolina, 1787," *The James Sprunt Historical Publications*, No. 2, 17 (Chapel Hill, N.C.: University of North Carolina Press, 1922), p. 13.

43. Richard Blackledge to Patrick Dougall, 5 June 1784, "Richard Blackledge Letterbook," p. 211.

44. *Ibid.* Blackledge also told Dougall that the Brig *Young*, Captain John Wallace commanding, had been dispatched to his location (Bristol, G.B.) with $2,000 in silver. That money was to be deposited in the account of Blackledge & Singleton as credit for the new company.

45. *Ibid.*

& remainder of the goods, for us to use in the West Indies Trade During the Winter & in the Spring to Come Home with Remittance in Part for the Goods.[46]

However, the partnership survived less than two years. On 20 June 1785, Blackledge and Company notified a British merchant named Henry Cruger that the store would not import anymore goods.[47] Blackledge stated in another letter on 28 February 1786 that his "British Friends, instead of Sending me out goods have sent me an Overseer." Blackledge explained that the appointment of the overseer called for his most ardent exertions to exonerate himself, adding that his creditors at Washington, North Carolina pressed him "if possible Ten times harder in Consequence of the Deraigement." He emphasized that his financial condition called for his "most ardent exertions and the zealous assistance" of his friends to support him.[48] The overseer had been appointed to exonerate both Singleton and Blackledge of the debts that they had both incurred during their brief, unsuccessful venture.[49] This venture represented a joint effort between two shipping merchants in the mid-coastal area of North Carolina (Pamlico and Neuse river area) to engage in direct trade with Great Britain. Its failure and the lack of evidence showing success of other similar ventures suggest that it was difficult for this area of North Carolina to engage successfully in such commerce.

Meanwhile, during this period travellers visited North Carolina and frequently described the Port of New Bern. An Englishman named J. F. D. Smith said New Bern stood on "a very beautiful spot, on the banks of the Neuse, at the confluence of a pretty little stream, somewhat larger than Wilmington [North Carolina]." Smith added that the town contained "several exceedingly good and even elegant houses."[50] Another traveller wrote that many of New Bern's houses were "large and commodious" and two stories in height, and noted that practically all of the town's dwellings were built of wood.[51]

According to travellers' accounts, shipping businesses usually operated from the houses of New Bern's merchants. In residences owned by the port's most successful ones, a front room downstairs was often used as a "counting house." A separate entrance led to the room, and a warehouse was located out back for the storage of goods. Many of the homes that belonged to New Bern's merchants had captains' or widows' walks. Today, those walks can be seen atop the dwellings along Craven and Johnston streets overlooking the Neuse River, and atop other dwellings on Pollock and Broad streets overlooking the Trent River.[52] During the late 1700s, one visitor vividly described New Bern's port facilities and activities:

> There are convenient Wharves at Newbern, these are mostly on the Trent side of the Town where the Shipping generally lay . . . . There is a small church here with a square tower, Cupola and Bell & it is the only place of Worship in the Town. This place being the County Town of Craven County, there is a brick Goal [Jail] here, and a Court House, the latter is raised on Arches; the Courts being held upstairs, the lower part serves for a Market place; tho' but little provisions are carried there; people coming in Boats and Canoes sell their Marketting at the River side.[53]

46. *Ibid.*

47. Richard Blackledge to James Fyfe, 20 June 1785, "Richard Blackledge Letterbook," p. 345. In this letter, Blackledge indicated that the partnership would soon fail. He stated that "The Situation of things not being Convenient which are aded to the differenc of opinions which are worse, is why Miss.r Singleton & WKeller & Self do not Copartnership for a longer time."; and Blackledge, Singleton & Company to Henry Cruger, 20 June 1785, "Richard Blackledge Letterbook," p. 347. Blackledge informed Cruger in this letter that he and Singleton would not import anymore goods.

48. Richard Blackledge to Samuel Parson, 28 February 1786, "Richard Blackledge Letterbook," p. 414.

49. Richard Blackledge to John Jones, 28 February 1786, "Richard Blackledge Letterbook," p. 419. Blackledge said "Mr. McKellar has sent in to Singleton & me an Overseer or man to press Remittances instead of an Assortment of Goods which is a large Gou'l or Fret in my Garment." He added that "Many Arraigments have been Adopted for the payment of the Ball due [per] their a/c Current and at last have fell on the following Plan, that is we Give up the Importation to him where on their Appears to be a Ball or Nett profit of about 10,000 Currency & he Step into the Companys Shoes & abid by the Consequences & Exonerate us from the Debt & Rise or fall by the transaction." Blackledge also discussed his northern debts and his overall financial position.

50. Dill, "Political and Commercial Rise of New Bern," 23 (January 1946), pp. 47-48.

51. Incomplete, typed copy of "Family Histories," The Taylor Family Papers, p. 75, Mary Bryan Hollister Collection, J.Y. Joyner Library, Archives and Manuscript Department, East Carolina University, Greenville, N.C. Issaac Taylor, one of New Bern's most prominent merchants, had a brick house on Craven Street four stories in height with one of the few if not the only slate roof in town, according to one account dated c. 1822. His house was arranged to the custom of the period, with a country house and a warehouse; and Lynda Vestal Herzog, "The Early Architecture of New Bern, North Carolina, 1750-1850," (Ph.D. dissertation, University of California, 1977), p. 350.

52. Mary Bryan Hollister Collection, J.Y. Joyner Library, Archives and Manuscript Department, East Carolina University, Greenville, N.C.; Attmore, "Journal of a Tour of North Carolina," pp. 45-46; and Herzog, "New Bern's Early Architecture," pp. 216-217. A trap door in the roof led to the captain's walk.

53. Mary Bryan Hollister Collection, ECU; Attmore, "Journal of

Business in New Bern expanded rapidly during the seven-year period following the War of the American Revolution. A public warehouse was built near the center of town in 1789 due to the large quantity of tobacco that was exported.[54] A number of saw mills, important to New Bern's lumber industry, operated nearby. One mill, owned by Jones Davis, was located on Slocumb's Creek just southeast of New Bern on the Neuse. Another one, constructed much earlier by Colonel William Wilson, was situated northeast of New Bern on a branch of Brice's Creek. These two mills, and about five others located within twenty-five miles of New Bern, contributed toward the town's extensive export trade in boards, scantling, shingles, staves, hoops and headings. These seven mills also provided wood for the construction of vessels as well as for the houses that the town's visitors described so well. A French traveller, visiting New Bern a little more than two decades earlier, described some of the mills:

> There is plenty of saw mills in this Country [area surrounding New Bern] set up at little Expense. wherever there is water that they can raise to the hight of 5 feet by means of a Dam or breastworks they Erect a mill, if there is a sufficient quantity of water; the wheels are undershot about 3½ foot Diameter and 10 or 12 in length, they are allways going, as the Country is Cover with timber such as pitch pine, read, black, and white oak (the two first are very bad wood), some walnut, spres [spruce] and sedar, they are always well supplied. there is generally a tub mil for grinding their Corn at the same Dam.[55]

Brigs or brigantines, and especially sloops and two-masted schooners, sailed in and out of the Port of New Bern from the late eighteenth to early nineteenth centuries.* The 42-ton sloop *Three Sisters,* built in New Bern in 1788; the 113-ton schooner *Fair American,* built in Craven County in 1805; and the 160-ton brigantine *Little Frank,* built in Craven County in 1802, were the kinds of vessels that sailed in and out of the Port of New Bern. Of 26 vessels built in New Bern and Craven County between 1783 and 1812*, 18 were sloops and schooners. Of 117 vessels constructed in North Carolina, 79 were also sloops and schooners. Because such vessels were more economical to build and more efficient to operate, they were preferred for the coastwise trade that New Bern primarily engaged in. Ships were seldom built in North Carolina, and small vessels with shallow drafts were used instead.[56] Masters of such vessels could enter small ports without having to wait for pilots, quickly conduct business, and then just as quickly clear for other destinations.[57] The shallower and more dangerous the inlet, the smaller the vessels and the greater the percentage of sloops and schooners that sailed through it. One hundred and two vessels cleared New Bern from 7 January to 29 June 1789: 33 sloops, 31 schooners and 1 brig sailed to destinations along the Atlantic coast; 10 sloops, 14 schooners and 11 brigs sailed to the West Indies; and 1 schooner and 1 brig sailed to England.[58]

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a tour of North Carolina," p. 46; Lennon, "The Development of North Carolina Town Government, p. 12. According to Lennon, the space or floor beneath the county courthouse, in the vicinity of the town docks, was usually designated the marketplace in the initial stages of town development in North Carolina.

54. Dill, "Political and Commercial Rise of New Bern," p. 521.

55. Jonathan Price and John Strothier, *First Actual Survey of the State of North Carolina, 1808,* reproduced in *North Carolina in Maps* by W. P. Cumming (Raleigh, N.C.: North Carolina Division of Archives and History, Plate IX, 1966). Some of the other six mills within twenty-five miles of New Bern may not have been saw mills; instead, some may have been grist mills or a combination of grist mills and saw mills. All six mills were located near roads and/or waterways leading to New Bern. In addition, many other mills are identified further than twenty-five miles outside New Bern; J. Franklin Jameson, "Journal of a French Traveller in the Colonies, 1765," *The American Historical Review,* Part 1, 26 (July 1921), pp. 734-735.

56. Charles C. Crittenden, "Ships and Shipping in North Carolina, 1763 to 1789," *The North Carolina Historical Review,* 8 (January 1931), pp. 1-3, 9-10. Richard Stephenson and William N. Still, compilers, "A Statistical Analysis of Interstate and International Vessel Construction in North Carolina," (Greenville, N.C.: East Carolina University, 1977 to 1981). Statistics are not available for ships built for intracoastal trade because ships were not required to enroll or be licensed for commerce conducted within North Carolina. Throughout this article, specifications, dimensions and numbers of vessels built in North Carolina are discussed for the years 1783 to 1812. Only the state's leading port towns (port districts) and their respective counties are used for calculations: New Bern, Craven County; Wilmington, New Hanover County; Washington, Beaufort County; Edenton, Chowan County; Camden, Camden County; Beaufort, Carteret County; Plymouth, Washington County; and Ocracoke, Hyde County. Vessels built at other locations in North Carolina during the period are omitted from all calculations. All calculations and figures mentioned within the text have been made by the author of this article from the raw data provided by "A Statistical Analysis," which lists more than 4,000 vessels built in North Carolina during the eighteenth and nineteenth centuries.

57. Crittenden, "Ships and Shipping in North Carolina, 1763 to 1789," p. 3.

58. "Account of Vessels and Cargoes Cleared from Newbern in Port Beaufort since December 1788," (7 January 1789 to 29 June 1789), 31 August 1789, J[ames] Coor, Naval Officer, New Bern, N.C., Treasurer's and Comptroller's Papers, Box 5, Manuscript Room, North Carolina Division of Archives and History, Raleigh, N.C.; and Charles C. Crittenden, *The Commerce of North Carolina, 1763 to 1789* (Chapel Hill, N.C.: The University of North Carolina Press, 1973), p. 10.

Many flats, scows, canoes and raft-type barges transported products between the farms and the plantations and the Port of New Bern.[59] Jacob Kennedy of Trent Ferry, just north of New Bern on the Neuse River, advertised a small craft along with a larger vessel in the town's newspaper in 1799. Kennedy said he had a large canoe-type craft that could carry ten barrels. He also advertised a larger vessel, "a well built staunch little schooner," and emphasized that it sailed "remarkable fast."[60] The 16-ton vessel was typical of those employed to transport cargoes between other North Carolina ports in the intracoastal trade (trade within the state).

White oak, locust, pine and especially live oak and cedar were the types of woods most often used to build North Carolina vessels from 1783 to 1789. And New Bern's newspaper frequently advertised vessels built within the state that were ready for purchase. For example, on 1 August 1787 an advertisement stated that Titus Ogden had a new ship for sale and ready to be launched at "Bogue" (Bogue Inlet near Swansboro, North Carolina). The ship, built of live oak and cedar, had the following dimensions: 49 or 48 feet keel; 19 feet beam; 7 feet, 10 inches or 8 feet hold. The notice stipulated that "She will be sold CHEAP for Cost, or part Cash and the remainder in goods."[61] The fact that shipbuilding was an important industry in New Bern is confirmed by this statement in the town's *North Carolina Gazette* in 1791:

> There is not a place in America, perhaps there is not a country in the universe, where ship building may be conducted more conveniently than in the districts of Edenton and Newbern, in North Carolina, in this whole extent of one hundred and fifty miles nearly, by seventy or eighty, there are very few planters who do not live within ten miles of some water where ships may float. It is known that we have naval stores, and every foot of timber (live oak and cedar included) that is used in ship building: We have ship carpenters, and many of our citizens are sufficiently disposed to go to sea; we can build and navigate our own ships, &c.[62]

New Bern was nothing like Boston, New York, Philadelphia or even Norfolk or Charleston. But New Bern was an important North Carolina port, and it attracted vessels from its larger northern and southern neighbors. One hundred and one ships (approximately four each week) entered New Bern between 1 April and 1 October 1787; 44 of those vessels were sloops, 43 were schooners and 14 were brigs (mostly British). These vessels hailed from 27 other ports, north and south along the Atlantic Seaboard of the United States, from Great Britain, the Bermuda Islands and the West Indies.[63] Slaves and a wide variety of products, some of which are listed below, were imported between 1783 and 1789.

IMPORTS

"Sundries Growth and Manufacture of U. States"
Manufactures
Tea, Coffee, Cocoa
Molasses, Chocolate
Flour, Sugar, Salt, Pepper,
Bread, Biscuits, Rice, Tobacco,
Barley
Household Furniture (Windsor Chairs, Window Sashes, Tables, Chests, Boxes and Trunks)
Earthenware, Frying Pans, Pots, Dutch Ovens, Saws and Hardware, Iron
Card Tables, Cards, Pipes
Hats, Shoes, Linen
Lime
Indigo
Cables, Rigging, Cordage, Hawsers, Sea Stores, Anchors, Canvas
Wine (Many Kinds)
Gin, Brandy, Rum
Agricultural Produce
Powder, Shot, Flints, Guns (Duty Free)
Nails, Boards, Shingles
Bricks
Dry Goods
Oil
Saddles
Wagons, Carriages
Hay[64]

Keepers of taverns or ordinaries, owners of stud horses and carriages, and anyone who purchased packs of playing cards, die boxes and billiard tables were required to declare such purchases as taxable property each year. They were forbidden to merchandise or sell such items, and collectors were required to collect duties for such purchases whether they were

59. William and William Hollister, Jr., Collection, Manuscript Room, North Carolina Division of Archives and History, Raleigh, N.C.; and Attmore, "Journal of a Tour of North Carolina," p. 46.

60. The *Newberne Gazette*, 9 March 1799.

61. Fricke, Brinson and Still, *Croatan National Forest*, p. 8; Hutchins, *American Maritime Industries*, pp. 159-160; *The Martin's North Carolina Gazette* (New Bern), 1 August 1787; Jameson, "Journal of a French Traveller in the Colonies, 1765," pp. 734-735; and The *North Carolina Gazette* (New Bern), 24 September 1791.

62. The *North Carolina Gazette* (New Bern), 24 September 1791.

63. "Returns of Entries Made in the Collector's Office of [New Bern in] Port Beaufort," (2 April 1787 to 1 October 1787) 1 October 1787, John Dawes, Collector, New Bern, N.C.; and "Account of Entries Since the Last Return to the Governor in May 1785," (11 May 1785 to 28 October 1785), 30 October 1785, James Coor, Naval Officer, New Bern, N.C., Treasurer's and Comptroller's Papers, Boxes 4 and 5, Manuscript Room, North Carolina Division of Archives and History, Raleigh, N.C.

64. "Account of Entries Since the Last Return to the Governor in May 1785; and "Returns of Entries Made in the Collector's Office of [New Bern in] Port Beaufort," (2 April 1787 to 1 October 1787).

brought into the state over water or land.[65] New Bern steadily imported small numbers of slaves, particularly from Maryland. The North Carolina General Assembly in 1786 cited the Constitution of the United States and stated that the "Importation of Slaves into this State is productive of evil Consequences, and highly impolitic." But instead of prohibiting the trade, the Assembly said that collectors at North Carolina ports were to collect special duties on all imported slaves—according to their ages—brought in over land or water.[66] New Bern imported more goods from Philadelphia than from any other port along the Atlantic coast. On 19 May 1785, the brig *Two Brothers,* Captain Welsh, sailed into the Port of New Bern from Philadelphia with the following cargo: 1 anchor, 60 bars of iron, 3 casks of nails, 1 cask of saddle irons, 49 barrels of flour, 6 card tables, 36 Windsor chairs, 12 casks of biscuits, 1 cask of sugar, 1 cask of cotton cards, 1 hogshead of sugar, 40 cases of Gineva (wine) and 1 hogshead of hats.

However, cargoes from any given port varied greatly. On 11 June 1787, the 35-ton sloop *Industry,* Samuel Hubble, master, sailed into the Port of New Bern from Philadelphia carrying a different type of cargo: 175 loafs of sugar, 1 cask and 25 gallons of Lisbon Wine, "Sundries growth & manufactory of U. States, 858 bushels of corn and 'growth of U. States'."[67] From Charleston, South Carolina, on 14 April 1787, the sloop *Rainbow,* Calvin Delano, master, hauled to New Bern: 46½ pounds of loaf sugar, 280 pounds of coffee, 825 pounds of brown sugar, 100 gallons of rum, 15 cases of gin, 7 tieras and 315 gallons of Clarett Wine and 48 bottles of Porter Wine. The 33-ton schooner *Friendship,* Benjamin Hudson, master, sailed into the Port of New Bern from Maryland on 18 June 1787 with: 10 Negro women and 5 Negro men between twelve and thirty years of age, 4 Negro girls between seven and twelve, 2 Negro boys between seven and twelve, and 9 Negro children under seven.[68]

Many vessels imported cargoes to New Bern from the West Indies, especially from St. Eustatius. A typical shipment from that Caribbean Island, dated 16 August 1787, recorded that the 50-ton schooner *Godine* imported 17 hogsheads and 1,781 gallons of rum, 8 barrels of sugar, 3 bags of coffee, 459 loafs of sugar, 22 casks and 56 gallons of Madeira Wine.[69] This shipment resembles many of those imported from the West Indies.

New Bern also exported a wide variety of products. Below are quantities of some of the goods exported between 1785 and 1786:

EXPORTS

Shingles (pieces)	3,756,300
Timber, Planking, Scantling (feet)	2,341,580
Staves, Headings (pieces)	966,550
Hog's Lard, Bacon (barrels)	81,185
Corn, Rice, Peas (bushels)	31,761
Tallow, Wax (barrels)	30,761
Pitch, Tar (barrels)	27,932
Turpentine, Spirits, Rozin (barrels)	14,591
Hides, Skins, Furs (bundles)	8,902
Pork (barrels)	7,352
Snake Root (barrels)	5,076
Tobacco (casks)	1,460
Oats (bushels)	1,460
Indigo (hogsheads)	1,430
Cattle, Hogs (number)	805[70]

Note: The following were also exported: molasses, sugar, salt; bees wax and flour; boards, lumber, hoops, masts, ship timber; horses, poultry and turkies; ham and beef; flax seed, cotton and wool; rum and gin; bricks; slaves (small numbers in comparison to those imported); household goods; dry goods; and snuff.[71]

The North Carolina General Assembly announced in 1789 that "the Exportation of Raw Hides, Pieces of Hides of Neat Cattle, and Calf-Skins, and also of Beaver, Raccoon and Fox Furs" was "detrimental to

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65. Iredell, *Laws of the State of North-Carolina,* 22 October 1784, New Bern, N.C., chp. 3, p. 520.

66. Iredell, *Laws of the State of North-Carolina,* 18 November 1786, Fayetteville, N.C., chp. 5, pp. 577 and 578.

67. "Account of Entries Since the Last Return to the Governor in May 1785," 19 May 1785; and "Returns of Entries Made in the Collector's Office of [New Bern in] Port Beaufort," (2 April 1787 to 1 October 1787), 11 June 1787. Six different importers or companies were represented in this shipment: Abram Guerling, Henrion & Constantine, Tagert Ross & Company, Stephen Tinker and John Simpson.

68. "Returns of Entries Made Since the Last Return to the Governor in May 1785," (2 April 1787 to 1 October 1787), 14 April 1787, and 18 June 1787. Five importers or companies were represented in the June shipment—Benjamin Hudson, Issaac Hile, John Predu[a], William Schofield and William Hall.

69. "Returns of Entries Made Since the Last Return to the Governor in May 1785," (2 April 1787 to 1 October 1787), 16 August 1787. Two importers or companies were represented in this shipment: Thomas Thomlinson and James McKinley.

70. "Amount of Produce Entered for Exportation within the Years 1785 and 1786," Treasurer's and Comptroller's Papers, Port Beaufort, 1784 to 1789, Manuscript Room, North Carolina Division of Archives and History, Raleigh, N.C.

71. "Account of Vessels and Cargoes Cleared from New Bern in Port Beaufort Since December 1788," (7 January 1789 to 29 June 1789).

our own Manufacturers'' and passed legislation forbidding the exportation of such.[72]

From 7 January 1789 to 29 June 1789, 47 sloops, 51 schooners and 13 brigs sailed from New Bern to 21 ports as far south as Georgia and as far north as Bath, Maine, to Great Britain, the Bermuda Islands and the West Indies. The West India trade was the most important for exports, but when New Bern vessels sailed for the Caribbean their shipmasters usually did not specify the island or islands that they planned to sail to. They merely stated ''West Indies.''[73]

The cargoes shipped from New Bern varied widely, and some of the same kinds of goods were sent to many different places. New Bern also exported some of the same products it imported. The 75-ton brig *Craven,* Captain Wilson, master, cleared on 17 January 1789 for an unspecified destination in the Caribbean with a cargo of 40,000 feet of scantling, 88,000 shingles, 24 barrels of pork and 300 bushels of peas. The 60-ton Sloop *Polly,* Reca, master, hauled the following cargo to Philadelphia on 21 February 1789: 394 barrels of naval stores (tar, pitch, turpentine and rosin), 35 bundles of skins and 1,000 staves and hoops.[74] The schooner *Willing Maid,* Captain Bailey, shipped the following cargo to New York on 21 October: 6 barrels of pitch, 57 barrels of tar, 17 barrels of rosin, 3 barrels of spirits turpentine, 27 deer skins, 20 raccoon skins, 2 bear skins, 100 pounds of beeswax, 1 keg of indigo, 1 keg of snake root, 6½ bushels of potatoes and 90 cow hides. The 30-ton sloop *Rainbow,* Delano, master, exported the following cargo to Charleston, South Carolina, on 9 March 1789: 5 barrels of pork, 6 barrels of rozin and 5,000 staves and headings.[75]

New Bern, which primarily engaged in coastwise commerce, traded with Philadelphia more than any other port in the United States by the late 1780s. New Bern also traded heavily with Maryland, New York, South Carolina and Virginia. Trade with the Caribbean Islands was about as important as trade with all other American ports along the Atlantic seaboard combined. In fact, commerce with St. Eustatius in the West Indies was almost as strong as it was with Philadelphia. But New Bern traded heavily with other West Indian Islands, especially Guadeloupe, Martinique, St. Croix and Cape Francois.[76]

As one of North Carolina's three leading ports, the Port of New Bern attracted vessels from north and south along the Atlantic seaboard, the Caribbean, and occasionally the Bermuda Islands and Great Britain. Shipmasters shipped cargoes to New Bern, and returned home with cargoes from the mid-coastal area surrounding the port of New Bern. Planters and farmers surrounding New Bern shipped agricultural produce to the port for exportation. Lumber mill operators within the town's vicinity produced large quantities of wood products for exportation and the construction of vessels. Operators of naval stores industries within the area produced tar, pitch, turpentine and rozin from surrounding pine forests for local use and exportation. Even backcountry hunters found a market at the port for their hides, furs and skins. Merchants in New Bern received goods and manufactures from Northern states and Great Britain.

However, hazardous conditions within Ocracoke Inlet—particularly at the Swash—forced North Carolinians to pursue better access to the Atlantic Ocean for trade with other ports. Perhaps nothing demonstrates the negative impact that the situation at Ocracoke Inlet had on New Bern's commerce better than the proposal by North Carolinians to dig a canal between the Neuse River and the Port of Beaufort, North Carolina. The Clubfoot and Harlow's Creek Canal was proposed in order to help New Bern achieve better access to the Atlantic. As stated in The *North Carolina Gazette* in 1791, New Bern was:

> —or ought to be—the greatest market of North-Carolina (without the least injury to any of our other port towns) but for want of a better navigation, it is deplorable to reflect on the disadvantages that are daily produced; a vessel that

72. Iredell, *Laws of the State of North-Carolina,* 2 November 1789, Fayetteville, N.C., chp. 8, p. 668.

73. ''Account of Vessels and Cargoes Cleared from New Bern in Port Beaufort Since December 1788,'' (7 January 1789 to 29 June 1789), 1 June 1789; United States Treasury Department, ''Commerce and Navigation Records,'' *American State Papers,* 16th Congress, 1st Session, p. 393. According to this source, it was not unconmon for shipmasters to declare the destination of their vessels, upon clearing, and take a clearance for the West Indies generally.

74. ''Account of Vessels and Cargoes Cleared from New Bern in Port Beaufort Since December 1788'' (7 January 1789 to 29 June 1789), 17 January 1789 and 21 February 1789.

75. ''Account of Vessels Cleared Since the last Return to the Governor, in May 1785,'' (10 May 1785 to 20 October 1785), 21 October 1785, James Coor, Naval Officer, New Bern, N.C., Treasurer's and Comptroller's Papers, Manuscript Room, North Carolina Division of Archives and History, Raleigh, N.C.

76. ''Returns of Entries Made Since the Last Return to the Governor in May 1785,'' (2 April 1787 to 1 October 1787); and ''Account of Vessels and Cargoes Cleared, 7 January 1789 to 29 June 1789.''

draws more than nine feet water, cannot get over the Swash without lighters; after they are over they are exposed in an open Sound or wild road, the dangers of which have been sufficiently felt to need any further description.

. . . for all those acquainted with nautical matters, unanimously acknowledge, that with south-west as well as north-east winds, they can equally lay their course up and down, by keeping the one or the other side of the Neuse river; besides, vessels may put to sea (comparatively speaking) and most at any time from Beaufort, and [in a] couple of hours be in the ocean; whereas at Occacock, they may lay weeks waiting for a fair wind.[77]

Higher prices were paid for goods when shipping costs were higher. Because prices were higher at New Bern, many inhabitants from the interior of North Carolina travelled overland to ports in Virginia and South Carolina to obtain European, West India and East India goods. Larger deepwater vessels could safely enter and clear ports like Norfolk and Charleston, but not a North Carolina port like New Bern. New Bern's trade with Caribbean islands might have been greater, and the North Carolina port might have traded more successfully if it had been able to trade directly with European markets. Lighterage costs incurred by some shipmasters as they entered and cleared Ocracoke Inlet, and the limitations that the shallowness of that inlet placed on the size of vessels that sailed through it, also adversely affected the success of New Bern's shipping. The Swash within Ocracoke Inlet, and treacherous channels leading to New Bern, discouraged some shippers from trading with New Bern while high lighterage costs sometimes increased the price of goods shipped through the inlet. Nevertheless, as an important North Carolina port, New Bern was linked commercially between 1783 and 1789 with many other ports in the coastal trade. Located in the center of Eastern North Carolina amidst farms, plantations and forests, New Bern was therefore a major commercial center for North Carolina despite significant geographic disadvantages it faced in shipping.[78]

77. The *North Carolina Gazette* (New Bern), 24 September 1791.

Visitors passing through New Bern during the eighteenth and nineteenth centuries witnessed an entirely different New Bern than the one seen today. Sloops, schooners, brigs and brigantines, and small craft like flats, barges, canoes and ferries no longer plie the harbor and the Neuse and Trent rivers like they did two centuries ago. Shipmasters, mates and crewmembers from near and far no longer frequent the Port of New Bern as they did when this North Carolina town was a commercial center for the mid-coastal area of the state.

78. *Ibid.*

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He has had articles published in a number of publications, including The Southern Historian *of the University of Alabama, but this is his first article in the* Neptune. *This article, which is based on the second chapter of Stuart's master's thesis, is a thorough revision of an article he published in* The Southern Historian *several years ago. It now includes additional research on the topic of New Bern's commerce from 1783 to 1789, which the author was not able to incorporate earlier.*

Stuart now works as Senior Account Executive for Legend, Inc., an advertising agency in Marblehead, MA, but his interest in maritime history remains strong.

H.M. Storeship *Porpoise*, 1780-83

by David Syrett

At various times during the American Revolutionary War the Royal Navy purchased merchant ships to be used as naval storeships.[1] These merchant ships were bought and then converted to use by the Royal Navy at various Royal Dockyards. Most 18th century merchant ships were built by "rack of the eye" without any models or plans using information which was passed from one shipwright to another by word of mouth. What is important about merchant ships purchased by the Royal Navy is that unlike most other 18th century merchant ships the plans of these ships have survived and can be studied at the National Maritime Museum in England. One of these vessels was H.M. Storeship *Porpoise* which served in the Indian Ocean during the last years of the American Revolutionary War.

It was customary for the King's troops sent to India and naval stores for the ships of the Royal Navy to Indian waters to be carried, without charge, to India by the ships of the East India Company. However, as the fighting in India between the British and the French increased in scope it became only a question of time before the East India Company's shipping resources would be incapable of transporting all the men and stores required by the King's forces in India.[2] The Navy Board, which was the agency of the British government responsible for shipping the King's troops and naval stores for the Royal Navy overseas, as early as March 1780 began to make preparations to transport troops and naval stores from Britain to India in King's ships.

On 13 March 1780 the Navy Board suggested to the Admiralty that a ship of about seven hundred tons burden should be purchased to be converted into a naval storeship to carry naval stores to the British squadron in India.[3] The Admiralty of the Navy Board's suggestion and on 4 July 1780 the Commissioners of the Navy informed the Admiralty that they had purchased a Swedish ship named the *Hertigennan Af Sodermanland* of about seven hundred tons burden to carry naval stores to India.[4] There is in Britain no known records which show the history of the Hertigennan Af Sodermanland before the ship was brought by the Royal Navy other then that she had not been subjected to legal proceedings in the High Court of Admiralty.[5]

During March of 1780 the *Hertigennan Af Sodermanland* was surveyed by the officers of Woolwich Dockyard before the ship was purchased by the Royal Navy. From information obtained by this survey the officers of Woolwich Dockyard were able to produce both deck and profile plans [see figs. 1 & 2] of the *Hertigennan Af Sodermanland*.[6] The dockyard officers found that the *Hertigennan Af Sodermanland* had a "Burthen in Tons" of 651 and 16/99 tons;[7] and she was 33 feet 5 inches wides, a keel 109 feet 7 inches long, a hold 14 feet 3 inches deep and a lower deck 128 feet 6 inches long. From the shape of the *Hertigennan Af Sodermanland's* hull as seen in her deck and profile plands [figs. 1, 2] it is clear that the ship is a northern European bulk carrier and in many respects similar in

1. E.g. National Maritime Museum, Progress Books, No. 508. Hereafter this archive will be cited as NMM.

2. David Syrett, *Shipping and the American War*, (London, 1970), pp. 72-76.

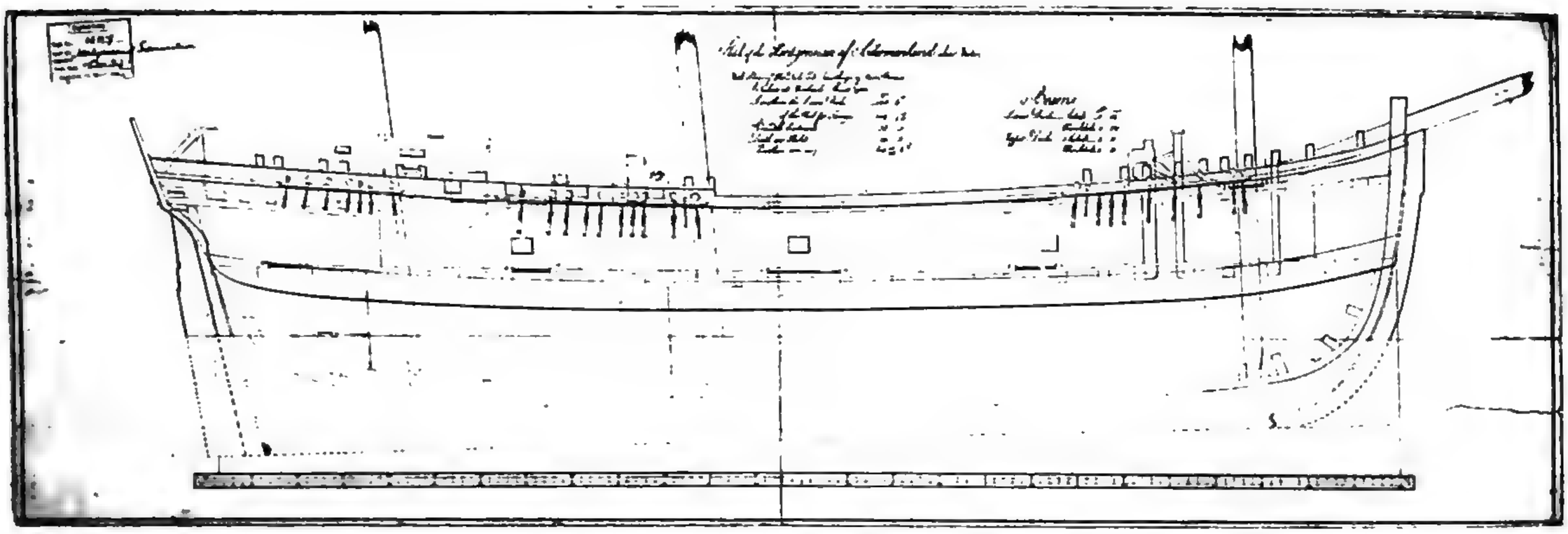
3. Public Record Office, ADM/106/2207, pp. 490-941. Hereafter this archive will be cited as PRO.

4. PRO, ADM/106/2208, p. 8.

5. PRO, *Index to High Court of Admiralty Prize Papers, 1776-1786*.

6. NMM, Ships plans, Box 59, Nos. 4117, 4118.

7. The *Hertigennan Af Sodermanland* using the standard builders' methods of measurement had a tonnage of 700 tons. J.J. Colledge, *Ships of the Navy: An Historical Index* (Newton Abbot, 1969), vol. p. 430. However, the Navy Board and Royal Dockyards used their own method of measuring a ship's tonnage. The tonnage of the *Hertigennan Af Sodermanland* was most likely arrived at by using the formula $\frac{(L - 3/5W/ \times W W/2}{94}$ equals tonnage. Syrett, *Shipping*, p. 111.



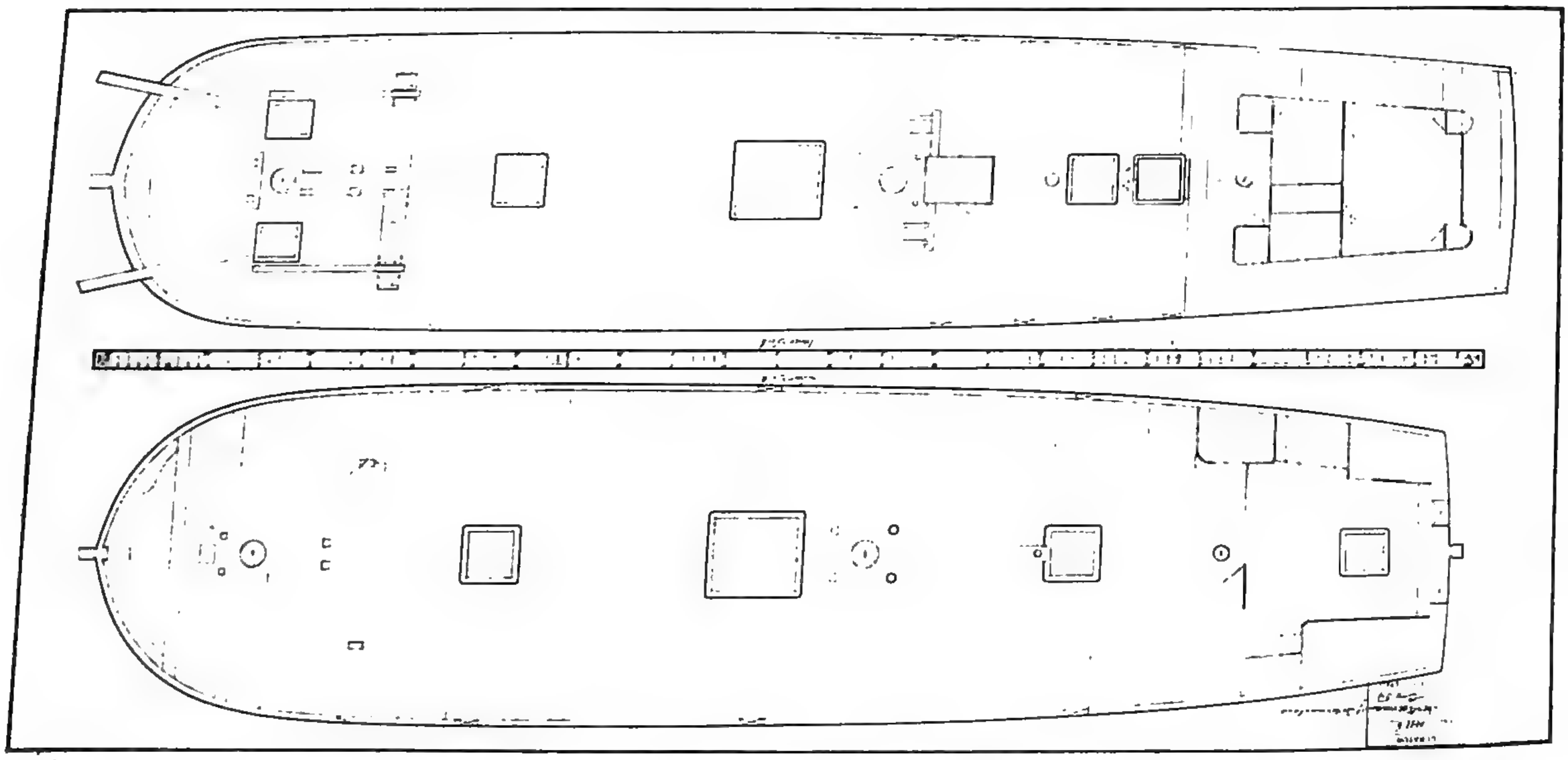
Sketch of the *Hertigennan of Sodermanland* above water. Ships plans, box 59, no. 4117. Courtesy of National Maritime Museum, London, England.

design to a British east coast colliers which were used to carry coal to London.[8]

After purchasing the *Hertigennan Af Sodermanland* the Admiralty directed that the ship be entered in the lists of the Royal Navy as a storeship named H.M. Storeship *Porpoise*. H.M. Storeship *Porpoise* would be armed with eighteen 6-pounder guns; four of which would be carried in her hold and mounted once the ship reached India. Originally it was intended that the ship have a complement of fifty men.[9] But H.M. Storeship *Porpoise's* crew was later increased to sixty.

8. Cf., NMM, Ships plans, Box 66, No. 3819 which is the deck plan of H.M.S. *Endeavor*—a former collier. See also, Fredrick Henrick Chapman, *Architectura Navalis Mercatoria* (London, 1971 reprint), plates xxi-xxx; David R. MacGregor, *Merchant Sailing Ships* (Annapolis, 1980), pp. 16-18, 20, 52-56.

9. NMM, ADM/A/2750, 14 April 1780.



Sketch of the *Hertigennan of Sodermanland*. Ships plans, box 59, no. 4118. Courtesy of National Maritime Museum, London, England.

H.M. Storeship *Porpoise* would be commanded by a lieutenant, and her crew would consist of a master, a clerk, a boatswain's mate, a carpenter's mate, a surgeon, a mate, a gunner's mate, two midshipmen, two quartermasters, forty-eight able seamen, and one servant each for the captain and master. The warrant and petty officers of H.M. Storeship *Porpoise* were to be paid "as the like officers in a fifth rate."[10]

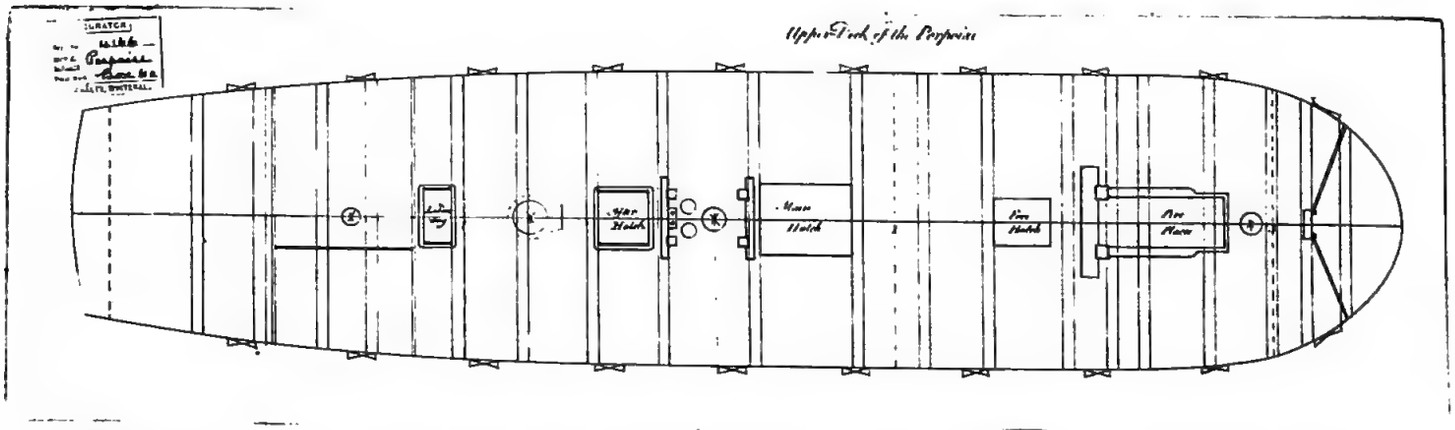
H.M. Storeship *Porpoise* before being commissioned and sent to India was modified and fitted out for foreign service at Woolwich Dockyard. The ship's hull was sheathed with planks. But much more importantly the entire upper works of the vessel were rebuilt and altered at Woolwich. At the stern of the ship a deck house was removed [fig. 1] and replaced by a raised after deck [figs. 3, 4 & 5].[11] Under this new third deck was built a captain's cabin with the type of windows mounted in the stern of the ship that most other British warships of the period had in their great cabins. Forward of the great cabin were small cabins for the surgeon, gunner's mate, master, and the midshipmen. Under the main deck in the stern of the ship were a number of storerooms [figs. 3, 4 & 5].

The upper works in the bow of H.M. Storeship *Porpoise* were also rebuilt. A third fore deck was added as was a large false stem to give the ship the appearance of a warship [fig. 5]. In the bow of H.M. Storeship *Porpoise* on the lower deck were a number of storerooms including those of the carpenter's mate, boatswain's mate, and gunner's mate. Just aft of these storerooms were the boatswain's mate's and carpenters mat's cabins [fig. 4]. Even though H.M. Storeship *Porpoise* was only to be armed with eighteen 6-pounder guns apparently twelve gun ports were made on each side of the ship for guns to be mounted on her main deck [figs. 3, 4, 5]. The overall effect of the alterations made to H.M. Storeship *Porpoise* at Woolwich Dockyard was to change the ship's appearance from that of a merchant ship into one of a warship [figs. 1,5].[12]

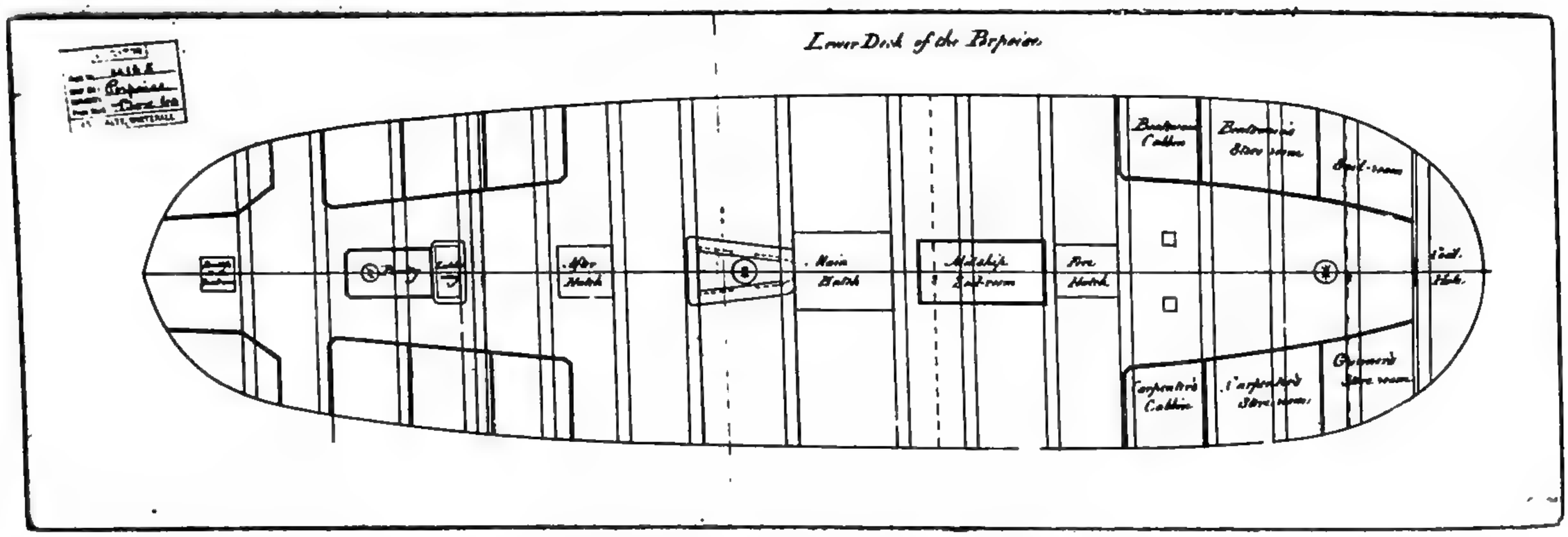
During the last months of 1780 as Britain moved towards war with the Netherlands the British government decided to attack and capture the Dutch colony at the Cape of Good Hope in order to protect British maritime routes to India. The expedition to South Africa, commanded by Commodore George Johnstone, consisted to three battalions of King's troops,[13] several warships, plus some East Indiamen, and a number of transports and storeships. One of the storeships was H.M. Storeship *Porpoise*. On 11 November the Admiralty directed that H.M. Storeship *Porpoise* be used as an armed transport and several days later the ship was ordered to be fitted and stored for foreign service.[14] However, even though some troops were embarked on H.M. Storeship *Porpoise* her main mission was to carry naval stores and she continued to be rated as a "King's Storeship."[15]

H.M. Storeship *Porpoise* sailed from Spithead on 13 March 1781 as part of a group of convoys bound to Gibralter and the East and West Indies which were escorted down the English Channel by the entire

10. NMM, ADM/A/2757, 13 Nov. 1780.
11. NMM, Progress Books, No. 496.
12. NMM, Ships plans, Box 60, Nos. 4165, 4166, 4168.
13. 2/42nd, 78th, 100th.
14. PRO, ADM/106/2604, 11 Nov. 1780; NMM, ADM/A/2757, 28 Nov. 1780.
15. PRO, ADM/1/164, f. 236.



Upper Deck of the *Porpoise*. Ships plans, box 60, no. 4166. Courtesy of National Maritime Museum, London, England.



Lower Deck of the *Porpoise*. Ships plans, box 60, no. 4165. Courtesy of National Maritime Museum, London, England.

Channel Fleet to protect the British convoys from attack by the large French squadron based at Brest.[16] When the three convoys were far enough out into the Atlantic to avoid enemy attack they separated and those ships going to the Cape of Good Hope and India, commanded by Johnstone, headed for Porto Praya in the Cape Verde Islands where they anchored on 11 April.

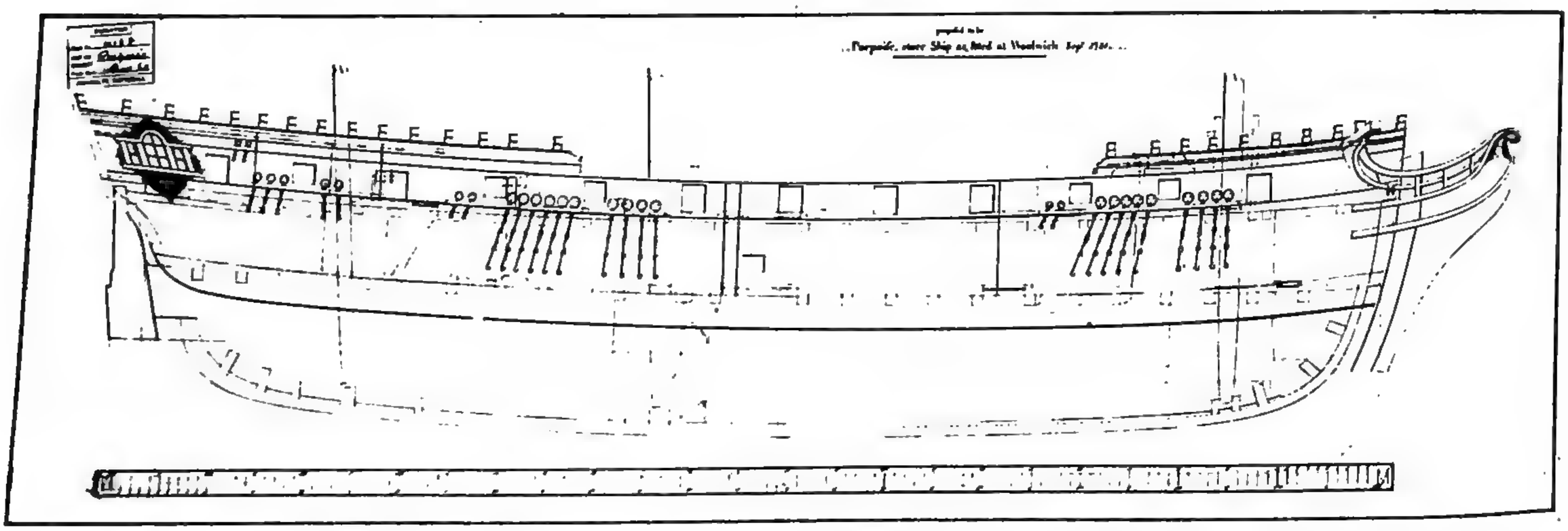
The French government learning of the British expedition to the Cape of Good Hope on 22 March dispatched a force of the five ships-of-the-line and one thousand troops to prevent the British from capturing the Dutch colony. Even though Johnstone's force had sailed from Europe several days before the French the British had lingered too long at Porto Praya and on 16 April three French ships-of-the-line led by Admiral Bailli de Suffren attacked the anchored British ships before proceeding to the Cape of Good Hope.[17] It is doubtful if H.M. Storeship *Porpoise* played any part in the battle of Porto Praya.[18]

After the departure of the French, Johnstone remained at Porto Praya for a fortnight patching up his squadron before sailing for the Cape of Good Hope.

16. PRO, ADM/1/95, f. 178.

17. William B. Willcox, "The Battle of Porto Praya, 1781," *American Neptune* (1945), vol. V, pp. 64-78.

18. A map in *Gentlemen's Magazine* (1781), vol. 51, pp. 616-617 places H.M. Storeship *Porpoise* deep in Porto Praya bay beyond the reach of the attacking French ships.



Proposed to be—'*Porpoife*, store Ship as fitted at Woolwich Sept 1780. . . .' Ships plans, box 60, no. 4168. Courtesy of National Maritime Museum, London, England.

When the British arrived at the Cape of Good Hope they discovered that Suffren had reinforced the garrison by landing a thousand French troops and the Dutch governor, knowing that a state of war existed between Britain and the Netherlands, had greatly increased the strength of Cape Town's fortifications. Having lost surprise and facing the prospect of having to make an opposed amphibious assualt on Cape Town, Johnstone lost interest in the expedition and returned to England looking for prizes and glory. And the remainder of the British force, including H.M. Storeship *Porpoise*, sailed for India.[19]

H.M. Storeship *Porpoise* arrived at Bombay on 22 January 1782. The ship being "very leaky" immediately unloaded her cargo of naval stores which were then loaded on other ships for transhipment to the British squadron in Indian waters.[20] After she was repaired for the next year H.M. Storeship *Porpoise* served in Indian waters transporting supplies for the British squadron under the command of Admiral Sir Edward Huges.[21] And on 18 January 1783 H.M. Storeship *Porpoise* was sold at Bombay for thirty nine thousand rupees.[22]

19. Piers Macesy, *The War for America, 1775-1783* (London, 1964), p. 390.

20. PRO, ADM/1/164, f. 292.

21. PRO, ADM/51/4293.

22. NMM, Admiralty Progress and Dimension Book, 1783-1793, p. 113.

There is nothing extraordinary about H.M. Storeship *Porpoise*. Her known history was that of a naval storeship which served in the East Indies for a year carrying stores and supplies from Indian ports to various units of the British squadron in India. The design of the ship was that of a northern European merchant ship of the last half of the 18th century and the later alterations made to H.M. Storeship *Porpoise* by the dockyard officers at Woolwich had been carried out on scores of other ships before H.M. Storeship *Porpoise* entered the Royal Navy. What makes the history of H.M. Storeship *Porpoise* important is that she is one of the few merchant ships of this period whose plans have served and that a part of the vessel's history can be documented.

David Syrett received his doctorate from the University of London and is presently a professor of history at Queens College, CUNY. His articles have appeared in The American Neptune, Naval War College Review, Military Review, The Mariners' Mirror, Armed Forces and Society, and others.

U.S. Navy Steam Sloop *Princeton*

by Spencer C. Tucker

IN 1844 a revolutionary new naval vessel joined the United States Navy, the steam sloop *Princeton*. Destined to have an unfortunate yet important career, *Princeton* was the result of collaboration between John Ericsson and Robert Stockton, political pressure, and changing attitudes in the Navy.

The War of 1812 had demonstrated the superiority of ships armed with heavy long-range guns. The next step was to rely on larger vessels with a few heavy guns, eliminating the largely ineffective and more numerous smaller ones. A fast vessel armed with only a few of the biggest guns able to fire accurately to the longest range would have a tremendous advantage. At the same time, steam propulsion, ironclad vessels, and the new shell guns were rendering the old wooden sailing ships obsolete. Among officers arguing for such changes in the U.S. Navy was Robert Field Stockton.

Born in 1795, Stockton had been a junior officer in the War of 1812. His considerable wealth allowed him to take leaves of absence from the Navy to pursue other interests, such as the building of the Delaware & Raritan Canal in New Jersey, in which his family had a considerable interest.[1] In the 1830s, the Navy was in a period of retrenchment, and Stockton saw his chances for advancement receding.

The financial panic of 1837 led Stockton to travel to Britain to seek financial assistance for completing the canal project. While there, Francis Ogden introduced him to Swedish inventor John Ericsson. Ogden, U.S. Consul in Liverpool, designed steam engines and was a business associate of the Swede.[2]

Born in Sweden in 1803, John Ericsson had been trained as an engineer and had served as an artillery captain in the Swedish Army. He moved to London in 1826 and tried to interest the British government in his inventions, including an improved steam locomotive and the screw propeller (an invention for which he shared credit with Francis Smith). A leader in promoting the use of steam power for ships, Ericsson had designed and demonstrated a small screw steamer, the 45'8" *Francis B. Ogden,* in 1837, but the Lords of the Admiralty remained unconvinced of its utility.[3]

Both Ericsson and Stockton were men of considerable ego, and by the time he met Stockton, Ericsson was frustrated by the lack of acceptance of his work in Britain. He was therefore receptive to Stockton's suggestion that he would receive recognition in the United States.[4] Before he left England, Stockton commissioned Ericsson to build a small iron-hulled screw steamer. This was the *Robert F. Stockton,* the first direct-acting screw propeller engine vessel ever built. It was a 70-foot iron steamboat, 30 tons burden, drawing 3 feet of water, and powered by a 50 hp engine. It crossed the Atlantic under sail and was employed on the Delaware & Raritan Canal, where it remained in service for more than twenty-five years.[5]

In December 1838 Stockton was promoted to captain and ordered to the Mediterranean.[6] On the way he delivered dispatches to the American Minister to Brit-

1. William C. Church, *The Life of John Ericsson* (New York: Charles Scribner's Sons, 1906), I, 92. While Stockton was a capable officer, clearly his personality left something to be desired. Bauer described him as "vain, overbearing, tactless, and glory-seeking." K. Jack Bauer, *Surfboats and Horse Marines. U.S. Naval Operations in the Mexican War, 1846-48* (Annapolis, Maryland: United States Naval Institute Press, 1969), p. 165.

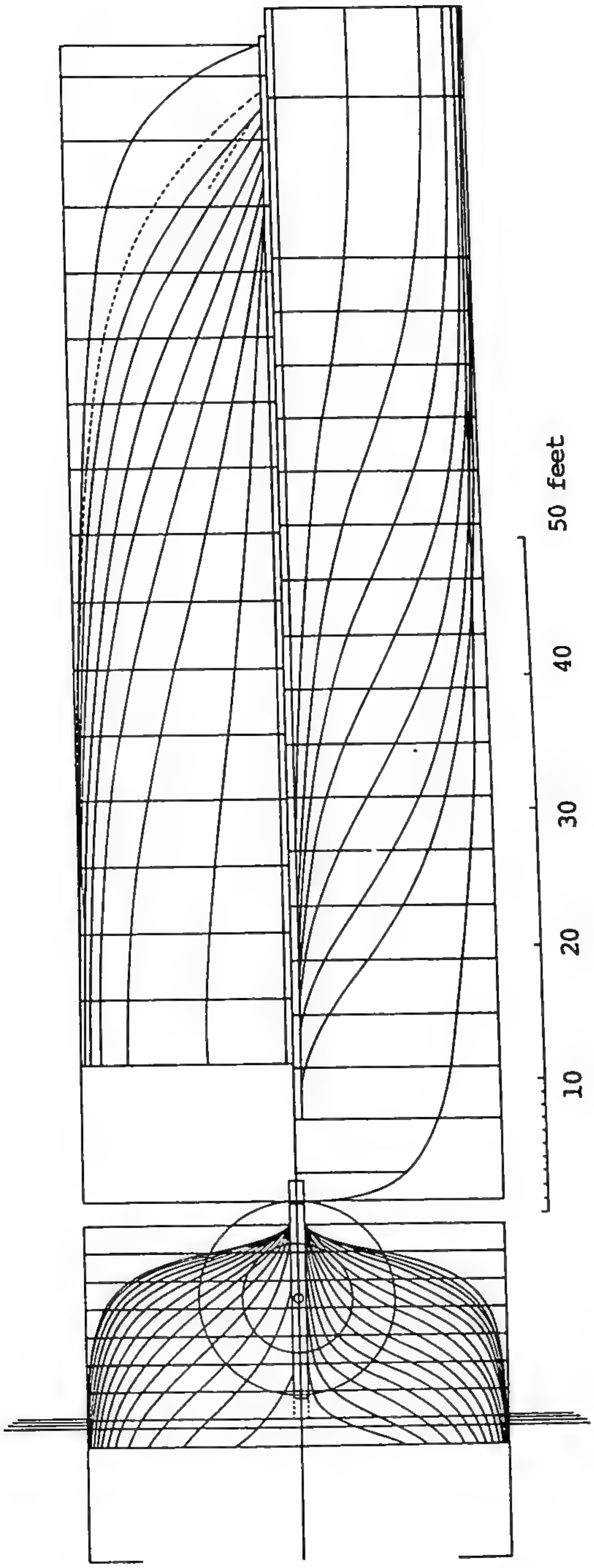
2. Church, *The Life of John Ericsson,* I, 91.

3. John O. Sargent, *A Lecture on the Late Improvements in Steam Navigation and the Arts of Naval Warfare, with a Brief Notice of Ericsson's Caloric Engine* (New York: Wiley and Putnam, 1844), pp. 12-13.

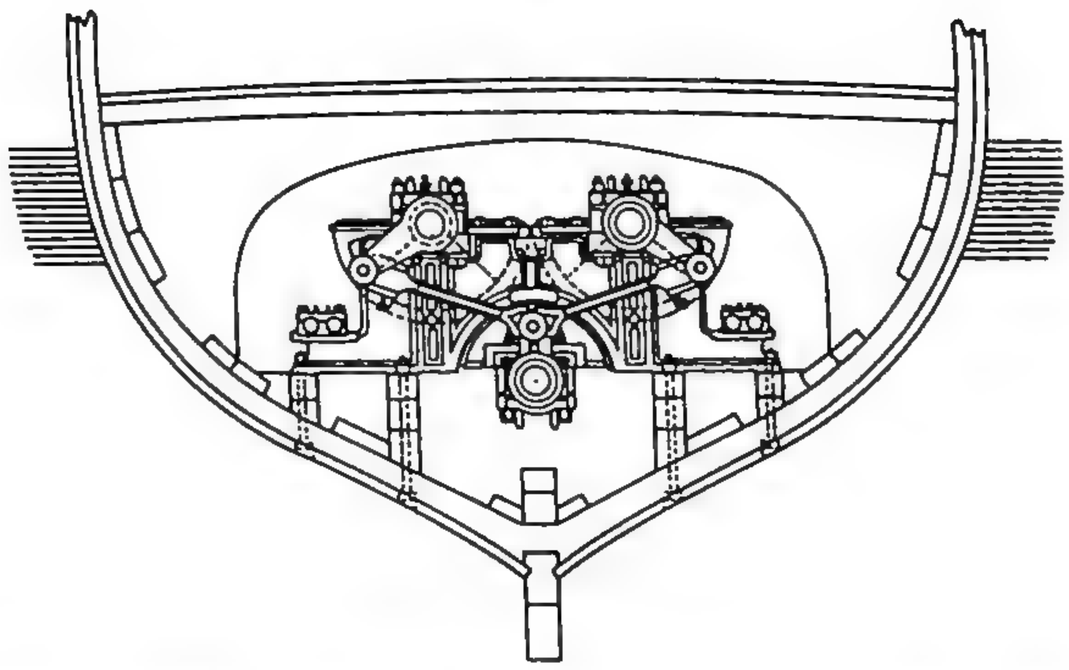
4. After the break between the two men, Stockton claimed that Ericsson came to the United States on his own, without any encouragement from him, and that it was Ericsson who had made the overtures. Stockton's subsequent maximum praise was a reference to Ericsson as a "clever mechanic." Edward Beach has shown how the breakdown in the relationship between Stockton and Ericsson was a major factor in the resulting "Peacemaker" disaster. Captain Edward L. Beach, *The United States Navy, 200 Years* (New York: Henry Holt, 1986), pp. 196-222.

5. Church, *The Life of John Ericsson,* I, 87, 94-95, 102.

6. As fleet captain of Commodore Hull's flagship. *Ibid.,* I, 93.



Draft from which the *Princeton* was laid down. After the original drawing in the National Archives, Record Group 19. The drawing is marked, "Received from Capt. Stockton, the 26th October, 1841." Redrawn by William J. Clipson.



Transverse section of the *Princeton* and front view of her engines. After a drawing in William Conant Church, The Life of John Ericsson (New York: Charles Scribner's Sons, 1906), I, 134. Redrawn by William J. Clipson.

ain and witnessed the trial of the *Robert F. Stockton.* Stockton also met with Ericsson, Ogden, and William Young, then manager of West Point Foundry in the United States, to discuss the manufacture of a 12-inch wrought-iron gun. On his own authority Stockton ordered the gun to be manufactured by the Mersey Iron Works near Liverpool.[7] He intended it as the prototype of a new armament for the U.S. Navy. The gun, named the "Orator" by Ericsson, was shipped to the United States in 1841.[8]

Ericsson had preceded "Orator," arriving in the United States at the end of 1839. He took up residence in New York City, awaiting word from Stockton about a contract from the Navy for a steam warship. In the meantime, he busied himself with the construction of commercial steamers utilizing his propeller.

Much of the early opposition to war steamers was well founded, for the initial types had a number of shortcomings. Their power plants were unreliable, inefficient, and consumed large amounts of fuel (in part for these reasons, all early steamers had sail rigs). Their machinery was also located above the waterline and thus vulnerable to being disabled by shot and shell. The paddle wheels were also exposed and were, in any case, an inefficient means of propulsion. The positioning of the paddle wheels on either side of the vessel also prevented using batteries of broadside guns, the traditional means of ship armament.

At the time of Ericsson's arrival in the United States, there was only one steam vessel in the U.S. Navy, the small frigate *Fulton II.* Commissioned in 1837, she was a 720-ton side-wheeler, suited only to coastal service and too small for the original armament of 8 42-pounders and 1 24-pounder. *Fulton II* was only the second steam vessel built for the U.S. Navy.[9] In

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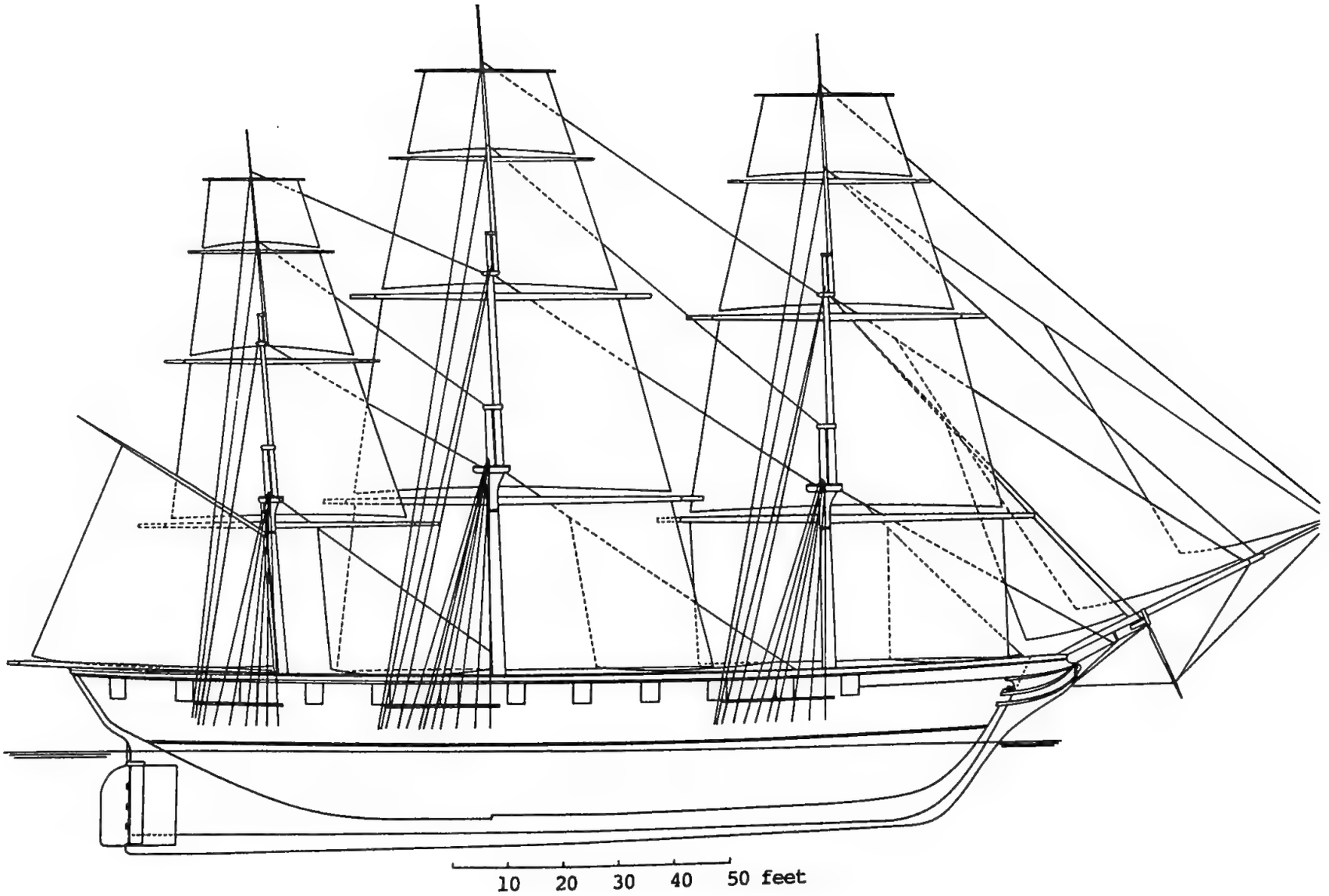
7. There has been debate about who was responsible for the gun's design. In the course of his testimony before the Naval Court of Inquiry investigating the "Peacemaker" explosion, Ogden was asked what led Stockton to decide about the gun. He answered: "They were, as I understood at the time, calculations, I believed, made by Captain Ericsson from scientific works on the subject, and from his own experience." Ogden's testimony was included in the proceedings of the Court of Inquiry included in U.S. Congress, House, Committee on Naval Affairs, *Accident on the Steam-ship "Princeton,"* 28th Cong., 1st Sess., May 15, 1844, House Report 479, p. 6. Ericsson certainly claimed responsibility for its design: "I readily met the wishes of Captain Stockton, and at once prepared drawings of a gun of 12-inch calibre." John Ericsson, *Contributions to the Centennial Exhibition* (New York: Printed for the Author at "the Nation" Press, 1876), p. 400.

8. It has been stated (for example, Thomas Hornsby, "Oregon and Peacemaker: 12 Inch Wrought Iron Guns," *The American Neptune,* VI, No. 3 (July 1946), p. 212) that Ericsson brought "Orator" with him when he arrived in the United States on November 23, 1839 on the *Great Western.* But a bill of lading shows it was shipped by Ogden to America in 1841 on the *John Taylor,* identified as a hydraulic tube. Lee M. Pearson, "The Princeton and the Peacemaker," *Technology and Culture,* VII, No. 2 (Spring, 1966), p. 167. It is at least possible that the exact nature of the manufacture was concealed. Ogden described the gun tube simply as "a shaft." The Mersey Iron Works near Liverpool, manufacturers of the gun, warranteed it "to be perfectly welded, and without flaw or crack inside or out." The gun had not been bored. This was done in the United States as was the application of trunnions, secured to the gun by a band. Ogden's testimony to the Naval Court of Inquiry in House Report 479, p. 5.

9. The first, *Demologus (Fulton I)* came into service in 1815, too late to see action in the War of 1812. She was, however, essentially a harbor defense vessel, designed to defend New York City. She blew up on June 4, 1829, killing twenty-five people. There was also steam gaillot *Sea-Gull,* a purchased vessel of 100 tons used in the supres-



Sail plan of the *Princeton*. After a drawing done at the Philadelphia Navy Yard in 1843, now in the National Archives, Record Group 19. Redrawn by William J. Clipson.

1839, however, Congress authorized two additional steamers, the 1,700 ton side-wheel frigates *Mississippi* and *Missouri* both launched in 1841.[10] They were handsome and successful vessels, but their machinery was located above the waterline. Matthew Perry was in charge of the construction of *Mississippi,* but Stockton hoped to get command of *Missouri*. Ericsson apparently believed he would design her, and toward that end had brought not only plans for the new vessel but also models of her hull and engines. Both men expected that the new 12-inch gun might be the prototype of *Missouri's* battery. Stockton did what he could, apparently even showing the Ericsson models,[11] but the Navy decided that *Missouri* was to be a duplicate of *Mississippi,* and her command did not go to Stockton.

Stockton was a powerful political figure in his home state and campaigned successfully for William Harrison and John Tyler in the presidential election of 1840. When Harrison died a month after taking office, Tyler succeeded to the presidency and offered Stockton the post of Secretary of the Navy. Stockton declined (it subsequently went to Abel P. Upshur),[12] but he prevailed on Tyler to authorize construction of a new vessel that he would command.

In September 1841 the board of Navy Commissioners was authorized to build two additional steamers. One was to be designed by Lieutenant W.W. Hunter, and not to exceed 300 tons; the other was to be "on Capt. Stockton's plan, not exceeding six hundred tons."[13] The former was the *Union,* which became a vessel of 956 tons and had an experimental propulsion system of submerged horizontal paddle wheels.[14] The vessel to be designed by Stockton was only about half the size of *Missouri,* with one gun deck. While Stockton and Ericsson did not get the large vessel they wanted, they were allowed to build her as they wanted.

Ericsson had, in the meantime, been enjoying considerable success in the construction of propeller-driven commercial steamers.[15] In October 1841 Stockton summoned him to Princeton, New Jersey to inform him of the contract for the new vessel. Within a short time Ericsson had plans for both the ship and its steam plant.

The new vessel was the 672-ton second-rate steam sloop of war *Princeton,* named for Stockton's home town. Her keel was laid in early 1842; she was launched in September 1843, and commissioned in October 1844. She had an authorized complement of 166, including a crew of 151 (15 of whom were in the engineering section) and 15 marines.[16]

Princeton was conceived as an experimental vessel. She was 164 feet in length of deck and 673 tons burden. Extreme beam was 30 feet, 6 inches. Draft of water at deepest load, with 200 tons of coal on board, was 19 feet, 4 inches; the length between perpendiculars was

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sion of piracy in the West Indies in 1822-1825. Employed as a receiving vessel at Philadelphia for many years, she was finally sold out of the service in 1840. *Fulton II* was the pioneer steam war vessel of the U.S. Navy. She was, like her predecessor however, essentially a harbor defense vessel. For some additional information on *Fulton II,* see K. Jack Bauer, *Ships of the Navy 1775-1969, Volume I: Combat Vessels* (Troy, New York: Rensselaer Polytechnic Institute, 1969), p. 43.

10. Rated at ten guns, they each carried 2 10-inch and 8 8-inch guns. Lieutenant George F. Emmons, *The Navy of the United States, From the Commencement, 1775 to 1853* (Washington: Gideon & Co., 1853), pp. 26 and 34.

11. According to Church, Stockton used an Ericsson-built model of a "war screw-steamer of two thousand tons," along with a set of detailed plans, in the fall of 1839 in conjunction with a presentation to the Navy Department. Church, *The Life of John Ericsson,* I, 120.

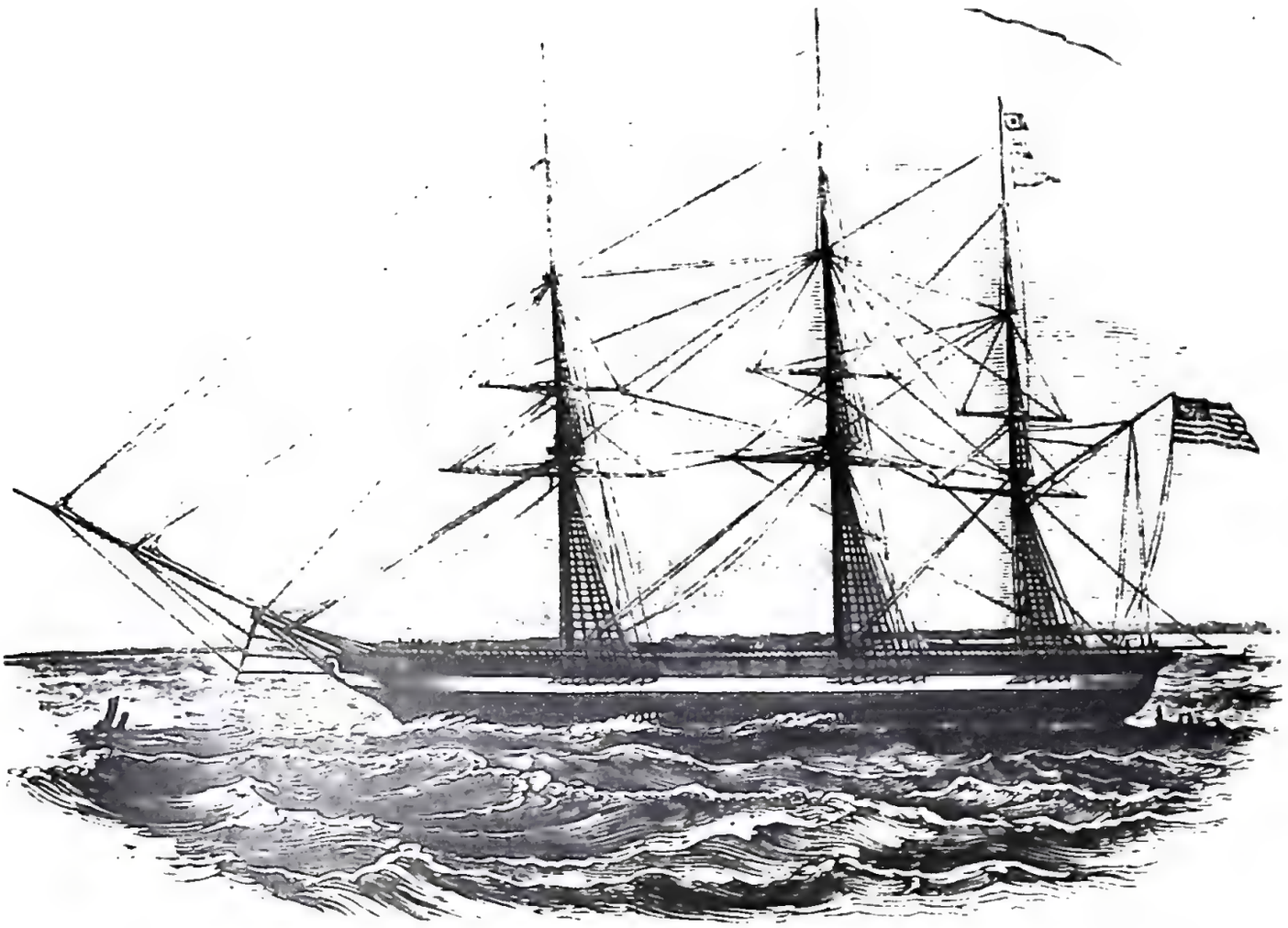
12. Samuel J. Bayard, *A Sketch of the Life of Com. Robert F. Stockton* (New York: Derby & Jackson, 1856), pp. 79-80.

13. U.S., Congress, House Document 65, 33rd Congress, 1st Session, p. 721.

14. Her armament was 4 8-inch guns. Emmons, *The Navy of the United States,* p. 34. *Union, Water Witch,* and *Alleghany,* were built during 1842-1848 to use the "Hunter propeller" system, designed by Lieutenant W. W. Hunter. The paddle wheels were placed horizontally in cylindrical recesses in the hull of the vessel. Much of the power of the engines was absorbed by the water, however. A naval board condemned the system in 1849 and the vessels were subsequently altered for other means of propulsion. F. M. Bennett, *The Monitor and the Navy under Steam* (Boston and New York: Houghton Mifflin, 1900), pp. 24-25.

15. These included two steamers on the Great Lakes and three on the Delaware & Chesapeake Canal between Philadelphia and Baltimore. Church, *The Life of John Ericsson,* I, 107-111.

16. The commander, three lieutenants, a master, a surgeon, a purser, an additional purser or assistant surgeon, six midshipmen, a boatswain, a gunner, a carpenter, a sailmaker, a clerk to the commanding officer, a yeoman, an armorer, a ship's steward, a master at arms, two boatswain's mates, a gunner's mate, a carpenter's mate, a sailmaker's mate, a ship's cook, four quarter-masters, four quarter gunners, two captains of forecastle, four captains of tops, two captains of afterguard, one captain of hold, a cooper, a surgeon's steward, a captain steward, a cabin cook, a wardroom steward, a wardroom cook, twenty-six seamen, twenty-six ordinary seamen, nineteen lansmen and boys, a chief engineer, two 1st assistant engineers, two 2nd assistant engineers, two 3rd assistant engineers, nine firemen, nine coalheavers, and three boys. This totals 151 officers and men. In addition there were fifteen marines: a sergeant, two corporals, one drummer, a fifer, and ten privates. Approved by the Navy Department, July 18, 1845. U.S., National Archives, Record Group 45, General Orders & Circulars, 1798-1875, Vol. II, 107.



THE AMERICAN STEAMER, "PRINCETON"

U.S. Navy second-rate steam sloop *Princeton*, from *The Illustrated London News*, V (May 25, 1844), p. 321.

156 feet. The depth of hold to berth-deck was 14 feet and depth from berth-deck to spar-deck was 7 feet 6 inches; this made the total depth of the hold 21 feet, 6 inches. The launching weight of the hull was 418 tons. She displaced, at 16-½ feet draft, 954 tons; and at 18 feet draught, 1,046 tons. Mean draft of water with 100 tons of coal and all other weights full was 17 feet. She was described in these words: "The peculiarity of construction is great sharpness of entrance and run, with nearly flat floors, midships. . . .[17] This prevented her from being crank, in spite of the great weight of her battery. The vessel was unique in other ways particularly in

> the great extent of her dead-wood, terminating in a stern-post of unusual thickness, being 26 inches through at the centre of the propeller shaft, but tapering both above and below. The object of this uncommon form is to give sufficient strength to the stern-post, as a hole of 13 inches diameter passes through it, in which the propeller shaft revolves. The stern-post also requires unusual strength, because the bearing which supports the whole weight of the propeller is attached to it, the shaft having no bearing abaft the propeller. The rudder is of an entirely novel construction, consisting of a frame of wrought iron filled in with five-inch pine plank, the whole of which is cased with copper plates, three-sixteenths of an inch thick, thus making the entire thickness of the rudder five inches and three-eighths. The mode of supporting

17. Report of a committee of the American Institute, quoted in *The Illustrated London News*, V (May 25, 1844), p. 321.

the rudder is equally novel. It is hung to an outrigger of wrought iron, covered with half-inch copper plate, the upper part being attached to a strong oak knee under the counter, and the lower part being attached to a solid frame of oak timber, three feet six inches wide, and fourteen inches deep, firmly bolted to the after part of the keel and dead wood of the ship. The thickness of the outrigger is five and three-eighths inches, the same with that of the rudder, measuring two feet fore and aft, the forward part being made as sharp as a ploughshare. This sharpness and the thinness of the rudder prevent the current produced by the propeller from retarding the progress of the ship.[18]

Stockton and Ericsson made *Princeton* the most technologically advanced warship of her time, but there are differing views about just how much each man contributed. Stockton was at least responsible for the sail rig,[19] although more than one writer has also credited him with the hull design.[20] Ericsson probably designed the hull and was certainly responsible for her engines and propeller. He also supervised all facets of the building, although officially the Navy gave Stockton general superintendence. Preble put it in these words: "This vessel was designed by and constructed under the superintendence of Captain John Ericsson. . . . Captain Stockton, who may be said to have been her originator, superintended her construction and was her first captain."[21] Baxter says she was built "under the patronage of Captain Robert F. Stockton and the superintendence of Ericsson."[22] Church notes that *Princeton* was the only one of his steamers that Ericsson actually supervised in its construction, and that he was occupied with the project for two years, from September 1841 to September 1843.[23] Administrative responsibility for the construction was further confused by the new bureau system, a succession of secretaries of the Navy, and Stockton's political influence.[24]

18. *Ibid.*

19. She was ship-rigged and spread 14,413 square feet of canvas in plain sails. Charles B. Stuart, *The Naval and Mail Steamers of the United States* (New York: Charles B. Norton, 1853), p. 44.

20. Commander A. H. Miles, "The Princeton Explosion," *United States Naval Institute Proceedings*, LII, No. 11 (November 1926), 2225; and Emmons, *The Navy of the United States*, p. 34.

21. Quoted in George Henry Preble, *A Chronological History of the Origin and Development of Steam Navigation* 2nd ed.; Philadelphia: L. R. Hamersly & Co., 1895), pp. 196-197.

22. James Phinney Baxter, *The Introduction of the Ironclad Warship* (Cambridge, Mass: Harvard University Press, 1933), pp. 13-14.

23. Church, *The Life of John Ericsson*, I, 135 and 155.

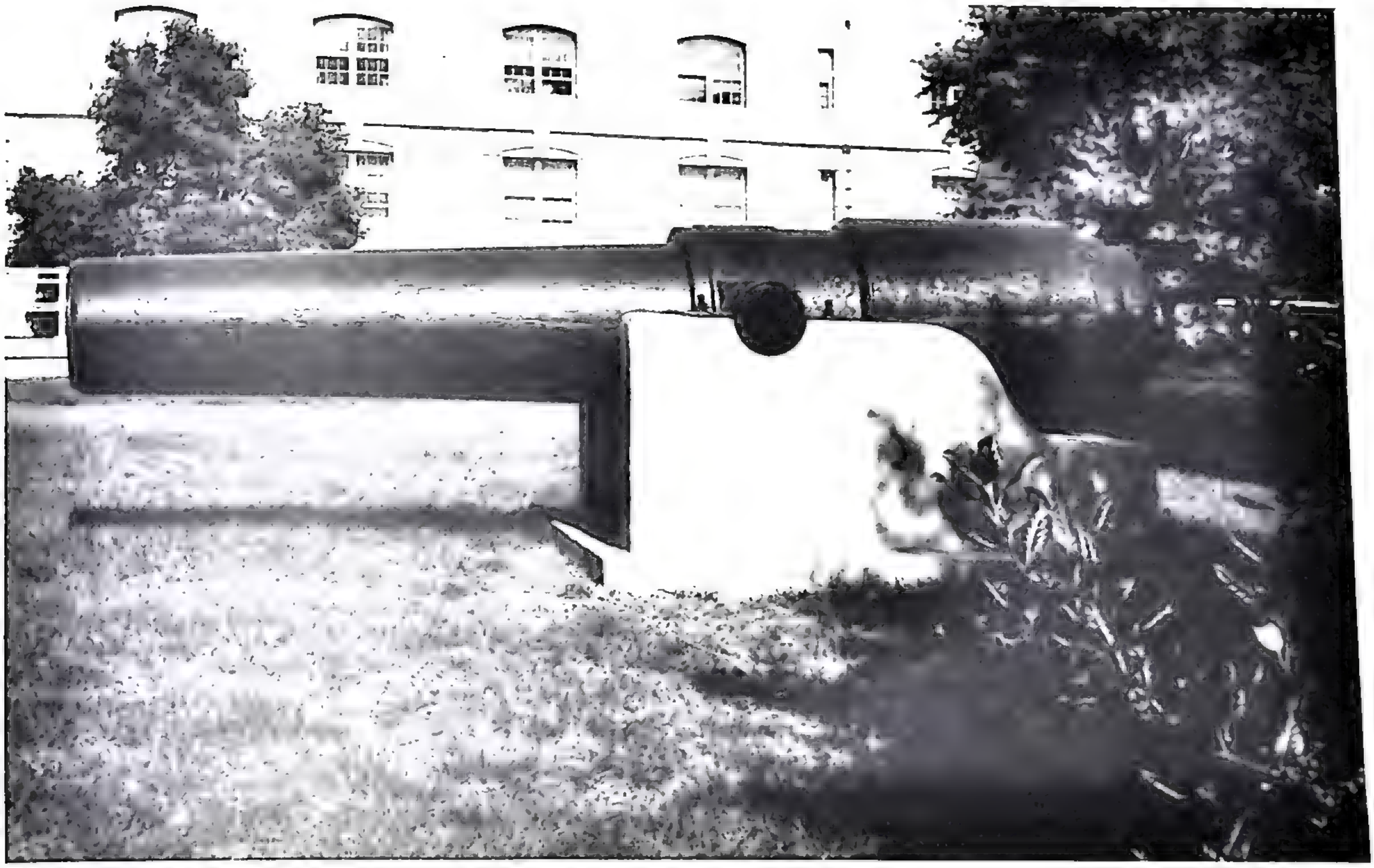
24. Pearson, "The Princeton and the Peacemaker," p. 168.

The *Princeton*'s hull was built by J. Lenthall and her engines and boilers by Merrick & Towne of Philadelphia. She cost $212,615 (including $81,416 for the hull; $60,403 for engines and $29,403 for boilers).[25] She was made of white oak, but her sides were thicker than normal in a vessel of her size. She was the first screw-propeller warship ever built in any country, as well as the first with her machinery (engines as well as boilers) below the waterline. The *Princeton* was also the first to burn anthracite as well as (commercial soft) bituminous coal, thus eliminating the tell-tale black smoke of the latter. She was also the first warship equipped with blowers (located in the bottom of the vessel) to produce better combustion and hotter furnace temperatures, which made possible rapid warming up of the power plant and obviated the need for a tall smoke stack to create draft (her smoke stack carried only to about five feet above the deck). Even if this was damaged by a shot, the draft created by the blowers would keep up combustion in the furnaces. Ericsson even designed the stack so that it could be lowered (by means of a crank) so as not to be visible above the bulwarks to conceal the fact that she was a steamer. *Princeton* also had sea-water-cooled surface condensers to recondense steam and do away with the necessity of a continuing resupply of fresh water.[26]

Princeton's propeller consisted of a cast brass hub 1-¾ feet in diameter with six arms; the arms were surrounded by a band or drum of copper, on which were riveted six brass blades. Each of the 4-foot 1-inch blades had a helicoidal twist. The drum was 8 feet in

25. Emmons, *The Navy of the United States*, pp. 32-33. Stuart's figure for overall cost is only slightly different: Materials, construction: $44,233.49; labor, construction: $37,182.28; materials, equipment: $26,829.00; labor, equipment: $3,132.48; machinery (engines, boilers, propeller, and bunkers): $101,137.30; total: $212,514.55. Stuart, *The Naval and Mail Steamers of the United States*, p. 50.

26. Emmons, *The Navy of the United States*, pp. 32-33; Edgar Stanton Maclay, *A History of the United States Navy from 1775 to 1901* (New and enlarged edition in 3 vols.; New York: D. Appleton and Co., 1924), III, 18; Baxter, *The Introduction of the Ironclad Warship*, p. 14; Horace Greeley et al, *The Great Industries of the United States* (Hartford, CT: J. B. Burr & Hyde, 1872), p. 598; Paolo E. Coletta, "Abel Parker Upshur," in *American Secretaries of the Navy*, Vol. I (Annapolis, MD: United States Naval Institute, 1980), 184. Ensign Henry C. Watts, "Ericsson, Stockton and the U.S.S. *Princeton*," *United States Naval Institute Proceedings*, LXXXII, No. 9 (September 1956), 964. Church, *The Life of John Ericsson*, I, 132-139. *The Illustrated London News*, IV (May 25, 1844), 331-332. Sargent, *A Lecture . . . in Steam Navigation*, p. 41. Stuart, *The Naval and Mail Steamers of the United States*, pp. 43-51. Also Ericsson, *Contributions to the Centennial Exhibition*, pp. 391-399.



The "Oregon" gun, located at the U.S. Naval Academy, Annapolis, Maryland. Photograph by Malcolm Muir, Jr.

diameter and the whole propeller with blades was 14 feet in diameter and weighed 12,000 lbs. The propeller was positioned so that the top of it was a full 3 feet below the surface of the water. The propeller had couplings on the shafts so that it could be disconnected from the engine when the vessel sailed under canvas alone; as the propeller turned to the reaction of the water, this somewhat reduced the drag.[27]

In 1839 Ericsson had patented what he called the "semi-cylindrical steam engine." It had been utilized for the first time in the *Stockton*. He took special pride in the new engine, and installed two of them in the *Princeton*.

These engines were both smaller and lighter than their English counterparts.[28] At a draught of 17 feet, the top of *Princeton's* engine was some 10 feet below the water line. (See illustration) This made her virtually impervious to damage from enemy shot and shell; the lower location of the weight also produced greater stability. The engines were far enough beneath the berth deck that there was space for storing two to three feet of coal above as well as on the sides. The engines also gave direct action to the propeller shaft.

27. Stuart, *The Naval and Mail Steamers of the United States*, p. 49.

28. Sargent asserts that they weighed less than half as much and occupied only one-eighth the space of English marine engines of comparable power. Sargent, *A Lecture . . . in Steam Navigation*, p. 39. The first English warship originally designed to utilize a propeller, and laid down after the *Princeton*, was the *Arrogant*. She had cylinders of virtually the same capacity as the Ericsson design but her engines occupied 2,812 cubic feet, whereas those of the *Princeton* took up but 1,734. The *Arrogant*'s engines were also much heavier than the 193,024 lbs. for those of the *Princeton*. Preble, *A Chronological History of the Origin and Development of Steam Navigation*, pp. 198-199. Preble's figures for the *Princeton* differ slightly from those of Stuart and I have used the latter. Preble gives the weight of the *Princeton*'s engines at 85 tons. Also, Stuart's cubic measurement for the engines is 4 cubic feet less. Stuart, *The Mail and Naval Steamers of the United States*, p. 46.

The unique feature was the construction and operation of the cylinders. Sargent provides this description;[29]

> In the place of complete cylinders, semi-cylinders are employed; the pistons of which, instead of being circular, and transversing from end to end of the cylinder, consist of parallelograms, having a radial or vibrating movement, similar to that of a pendulum, the centre of motion being the centre of these semi-cylinders. The semi-cylinders, are placed longitudinally in the very bottom of the vessel, and parallel to the line of keel. Motion is given to the propeller-shaft by means of short connecting rods, attached to vibrating crank levers on the axes of the vibrating pistons; and the latter are made to reciprocate by the admission of steam, alternately, on opposite sides, as in ordinary engines.

Princeton's engines proved to be more efficient than expected. Although rated at 220 horsepower, they produced upwards of 260, enabling the vessel to steam at over 12 miles an hour. Her extended speed under steam was much less, of course, and one mean performance with sail and steam, under moderate wind and ordinary sea, was 7.8 knots.[30]

Many observers regarded the engines as one of the most remarkable features of the vessel. Engineer-in-Chief of the U.S. Navy, Charles B. Stuart, wrote in 1853: "The semi-cylinder engine of the 'Princeton' is unquestionably the most remarkable modification of the steam engine that has ever been carried into successful practice."[31]

All of these advantages made *Princeton*, according to Stockton, "the cheapest, fastest, and most certain ship-of-war in the world."[32]

Stuart described her performance in these words:[33]

> At sea, she worked and steered admirably, either under sail alone or with sail and steam. She was a very dry vessel, but owing to the sharpness of her hull, fore and aft the amidship section, she pitched in a rough sea with great violence. With a fair amount of canvas and a moderate wind, she would careen to an unusual degree in a vessel of her class, but though she thus easily went down to her bearings, it took additionally a very large quantity of canvas and a strong wind to depress her sensibly further. In a heavy gale, clawing off a lee shore, she carried sail to a greater extent than was considered prudent by other sailing sloops of war in her company; all of whom, and some frigates, she beat out to windward, dragging her propeller.

The new sloop was finished by mid-October and on the 17th Stockton took her out on her first sea trial, to New York City. Most of the trip was made under sail, but steam was used for entering New York harbor. In what was clearly a publicity stunt, Stockton arranged to race the fastest steamer of the day, the trans-Atlantic sidewheeler *Great Western*, sailing from New York City. On October 19th, amid much fanfare, *Princeton* easily triumphed over a 21-mile course from Castle Garden to Sandy Hook. Sargent noted that the *Princeton* passed the *Great Western* under steam alone while the latter utilized both steam and sail. After overtaking the *Great Western*, *Princeton* circled around her and then passed her again. In all the *Princeton* had covered the distance from Castle Garden to Sandy Hook in 91 minutes, a speed of 14 miles an hour (about 12 knots).[34] The *Princeton*'s log describes the race in these words:[35]

> lying off the Battery for the Great Western, at 2.40 the Great Western hove in sight standing out the East River, under all sail and steam. On steam and made chase. The Great Western on our larboard beam. Cheered ship in passing her. At 3 set jib and spanker. The Western on our larboard quarter at 3.15. Set top sails and courses. At 3.30 set top gallant sails. The Great Western astern and dropping fast. At 4 the Western astern about 1 mile. . . . At 4.35 being outside of Sandy Hook. Passed ahead of the Great Western. Gave three cheers and kept away to the southward. Furled top gallant sails and took two reefs in the top sails at 5.20.

Princeton's triumph as a steamer was complete. As Bennett noted, she "silenced the objections that up to that time had enough of reason in them to exclude steam from navies."[36] Church observed that "her success was the final triumph of the principle of screw

29. Sargent, *A Lecture . . . in Steam Navigation*, p. 39. For a more detailed descriptions, see the article on the *Princeton* in *The Illustrated London News*, IV (May 25, 1844), 331-332.

30. Church, *The Life of John Ericsson*, I, 137 and Stuart, *The Naval and Mail Steamers of the United States*, p. 50. Stockton gave the top speed as 14 Statute miles per hour, on the Delaware River. At 12 miles per hour, coal was consumed at the rate of 1,800 pounds per hour. Report of the committee of the American Institute in *The Illustrated London News*, IV (1844), 331. Stuart notes that the mean performance cited of 7.8 knots was during her Mediterranean cruise. In that performance the screw revolved 25.678 times per minute; steam pressure in the boiler per square inch was 11.9 pounds; and the consumption of anthracite coal was 1,253 lbs. per hour. Stuart, *The Naval and Mail Steamers of the United States*, p. 50.

31. Stuart, *Ibid.*, p. 44.

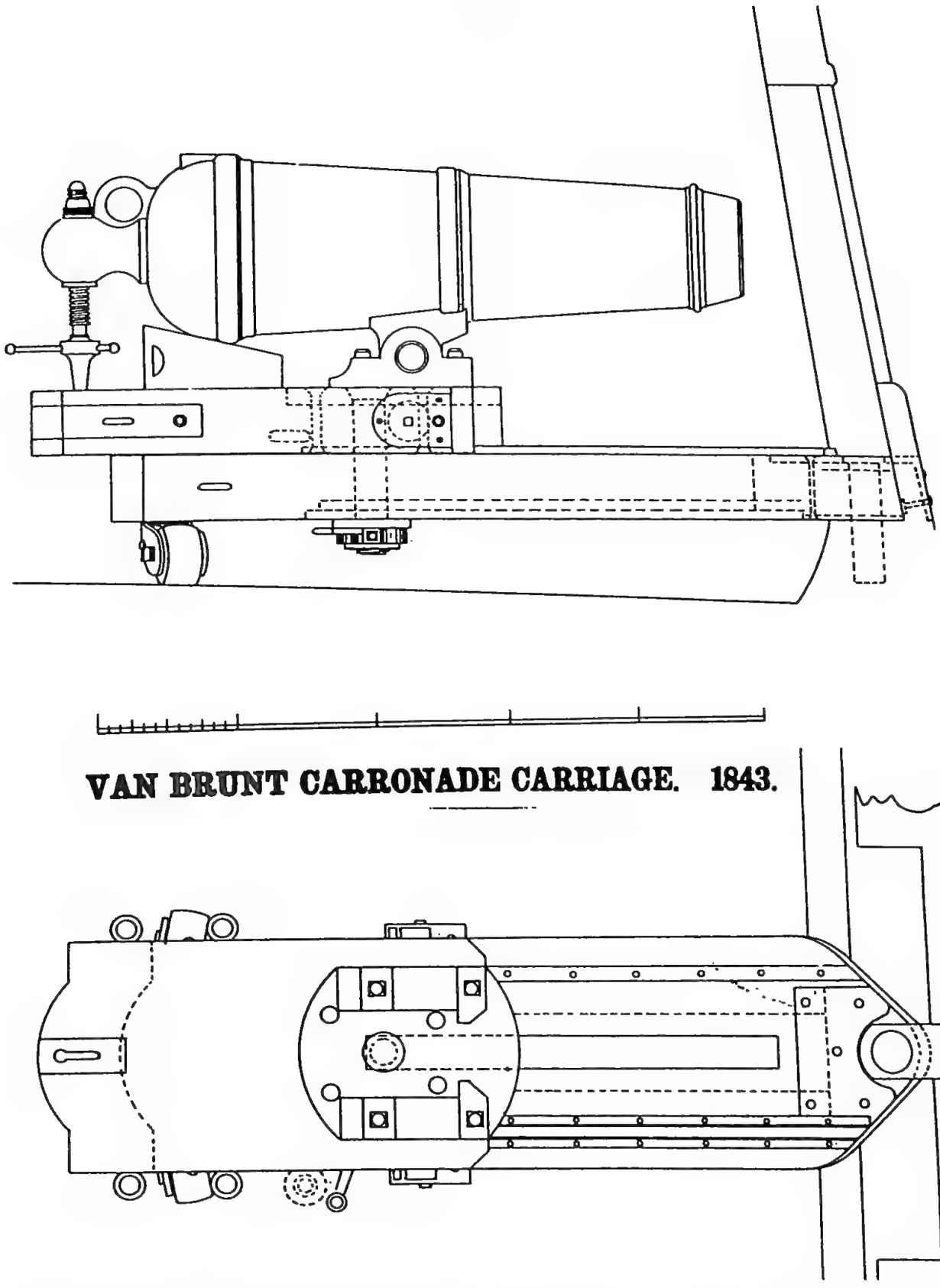
32. Stockton to Secretary of the Navy David Henshaw, February 5, 1844, quoted in Preble, *A Chronological History of the Origin and Development of Steam Navigation*, p. 197. In this long letter, quoted in full by Preble (pp. 197-198), Ericsson is nowhere mentioned, leaving the impression that the success of the sloop was all Stockton's doing.

33. Stuart, *The Naval and Mail Steamers of the United States*, p. 51.

34. John O. Sargent, *A Lecture . . . in Steam Navigation*, pp. 8-9.

35. U.S., National Archives, Record Group 45, *Princeton*, Log book I.

36. Bennett, *The Monitor and the Navy under Steam*, p. 27.



A carronade mounting, designed by Van Brunt. An original drawing in the National Archives, Record Group 74.

propulsion."[37] In 1858, Senator Stephen R. Mallory of Florida, who had chaired the Naval Committee and later served as Secretary of the Navy in the Confederacy, called the *Princeton* "the foundation of our present steam marine. It is the foundation of the steam marine of the entire world. . . ."[38]

Following her trip to New York, the *Princeton* returned to Philadelphia to finish her equipment; on January 1 she again left for New York City to take on her armament. This consisted of two 12-inch wrought-iron guns and twelve 42-pounder carronades. The big guns fired a 225pound shot (a grape stand weighed 256 lbs) and were on pivot mounts on the forecastle and quarterdeck. All of guns, according to Stockton, could "be used at once on one side of the ship," which gave her a greater weight of broadside than most frigates.[39] One of the 12-inchers was "Orator," the seven-ton gun that had been manufactured in England. It was renamed "Oregon" as a result of the current dispute with Britain over the northwest boundary. The other large wrought-iron gun had been ordered by Stockton in the United States; it weighed about ten tons and was manufactured by the firm of Ward & Co.[40]

The original plan had been to have just one 12-incher, mounted forward. A smaller gun—probably an 8-inch 64-pounder—was to have been installed aft. Stockton realized the advantage of having two big guns of the same caliber capable of firing in all directions and had the second gun built on his own responsibility, without the approval of chief of the Bureau of Ordnance and Hydrography, Captain William Crane. Crane was displeased with events and tried to bring Stockton under control, a losing battle since Stockton had the full support of the President.

Stockton was well pleased with the second gun, which—at least outwardly—appeared the better piece of worksmanship of the two,[41] despite the fact that it had been hastily made. Concern was allayed by the belief that American iron was superior in strength and tenacity to that of England. Wrought-iron guns, however, always had a problem in the uncertainty of their welds, and the trip hammer used in this case was not sufficient weight.[42] Furthermore, the gun had not undergone adequate proof; it was fired only five times and this is in no way compared with proof tests for "Orator" or other experimental ordinance.[43] Stockton had this to say about the second gun: "The men who made it deserve their money. It is worth all the guns on board of any frigate."[44] As it turned out, his confidence was misplaced. The second gun was received on board the *Princeton* in mid-January, and was christened the "Peacemaker" with six cheers by the crew.[45]

"Peacemaker" was accorded the place of honor at the bow, and was the gun fired for demonstration purposes. "Oregon" was mounted eighteen feet forward of the mizzenmast and in line with it. There is no evidence that "Oregon" was ever fired again after it was installed aboard the sloop).

In addition to the two big guns, Ericsson installed other ordnance innovations of his design. These included a new wrought-iron pivot carriage that dispensed with breeching, a first with heavy guns (see illustration) and the forerunner of the later Civil War monitor carriages. It was entirely of wrought iron with each side composed of two iron plates 5/16 inches thick and 4-½ inches apart, connected by a series of stay bolts. Only four men were required to roll the

37. Church, *The Life of Lohn Ericsson*, I, 136.

38. Speech in the United States Senate, May 14, 1856, in support of Ericsson's claim for reimbursement. U.S., Congress, Senate, 35th Cong., 1st Sess., 1858, XXVII, Pt. 3., 2131.

39. It is difficult to see how Stockton's claims could be realized since the carronades were on slide mounts in broadside. Still, her armament was formidable. Stockton to Secretary of the Navy David Henshaw, February 5, 1844, quoted in full in Preble, *A Chronological History of the Origin and Development of Steam Navigation*, pp. 197-198.

40. Some accounts credit the manufacture to the Phoenix Foundry or Hogg and Delameter of New York (for example, *Niles National Register* (Baltimore), March 2, 1844 and Miles, "The Princeton Explosion," p. 2230). The *Princeton*'s log says that the gun was picked up from the "Phenix" foundry. Watts credits it to Hamersley Forge (Watts, "Ericsson, Stockton and the U.S.S. *Princeton*," p. 964). Part of the confusion may stem from the fact that the Phoenix Foundry in New York City, originally owned by James Cunningham, was sold in 1842 to Peter Hogg and Cornelius Delameter (also given as De Lameter). This same firm provided the boilers, propeller, and blower for *Princeton*. Ericsson had established a close relationship with the firm immediately after his arrival in New York. Church, *The Life of John Ericsson*, I, 112. Ward & Co.'s Hamersley Forge, also in New York City, worked as a subcontractor to the Phoenix Foundry. Pearson, "The Princeton and the *Peacemaker*," p. 164.

41. *Niles' National Register* (Baltimore), March 2, 1844.

42. The inadequacy of the trip hammer was later admitted by Ward & Co. "Report on the explosion of the Gun on Board the Steam Frigate 'Princeton' " *Journal of the Franklin Institute*, Third Series, VIII (1844), 209-210. (Hereinafter cited as Franklin Institute Report.)

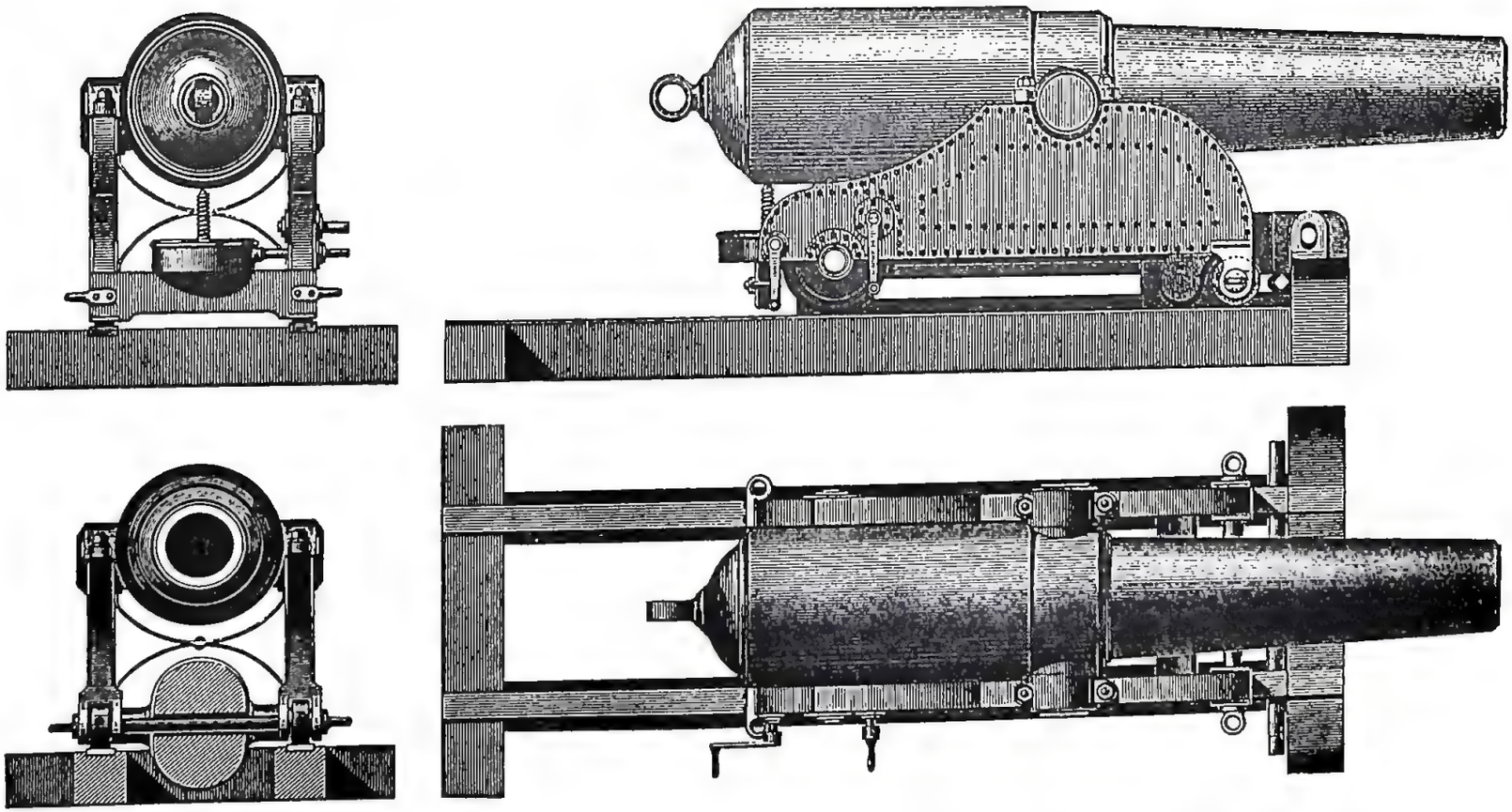
43. Only one of the firings, the last, was with shot; it was with one shot, two wads, and powder equivalent to 49.6 lbs. Letter of Stockton to Crane, January 16, 1844. In House Report 479, p. 41.

44. Stockton to Crane, letter of January 16, 1844, in House Report 479, p. 4.

45. U.S., National Archives, Record Group 45, *Princeton*, log book I, entry of January 17, 1844.

TWELVE-INCH WROUGHT-IRON GUN AND CARRIAGE. DESIGNED BY JOHN ERICSSON.

MOUNTED ON BOARD THE STEAMSHIP PRINCETON, 1843.



"Twelve-inch Wrought-iron Gun and Carriage. Designed by John Ericsson. Mounted on board the Steamship Princeton, 1843." Plate 41 in John Ericsson, *Contributions to the Centennial Exhibition* (New York: Printed for the Author at "the Nation" Press, 1876.

"Awful Explosion of the 'Peace-Maker' on board the U.S. Steam Frigate *Princeton,* on Wednesday, 28th Feby., 1844." A somewhat fanciful Currier & Ives lithograph.

guns back and forth on their skids. Pinching the plates together on the skid halted the gun's recoil. The compressor gear consisted of a cam moved by a lever. Ericsson's recoil mechanism was so successful that when the gun was fired with a charge of 30 lbs., it was checked in a distance of only 16 inches. The slide bed consisted of two longitudinal timbers secured by cross timbers and attached to the deck by a strong pivot, on which they turned. It was supported by four friction rollers situated in the four corners and travelling on a flat ring of metal let into the deck (see also the illustration of a later pivot mount on *Princeton*).[46] The gun was elevated by means of a tackle fixed to the breech. Church wrote, concerning the carriage and its friction gear: "nothing more reliable was contrived until Ericsson undertook the handling of the enormous monitor ordance."[47] There was also an automatic range finder and a self-actuating lock that caused the gun to fire at just the right elevation in the ship's motion.[48]

46. *The Illustrated London News,* IV (May 25, 1844), 331.

47. Church, *The Life of John Ericsson,* I. 131 and II, 142-146. Detail on the carriage comes from *The Illustrated London News,* IV (May 25, 1844), 331; also Ericsson, *Contributions to the Centennial Exhibition,* pp. 400-403.

48. The range finder was awarded a prize at the 1851 London Exhibition. See Ericsson, *Contributions to the Centennial Exhibition,* pp. 380-385. The self-acting gunlock had been invented as early as 1828. Ericsson had tried to interest the British in it but the Ordnance Department refused to agree to pay for the invention if it was not successful. As a trial would reveal its secrets, Ericsson kept it locked up until 1839 when it had been shown to Stockton. Sargent, pp. 42-44. Church, *The Life of John Ericsson,* I, 132.

While overstated, "Peacemaker" was reported in the press to be so accurate "that it could hit an object 'the size of a hogshead' 9 out of 10 times half a mile away."[49]

With *Princeton* now complete, Stockton took the sloop to Washington. It was clear he did not intend to share the limelight with anyone, for he left Ericsson waiting with his baggage at the foot of Wall Street when the *Princeton* passed by without stopping.[50] In a report Stockton wrote in February 1844, treating the warship's capabilities, Ericsson was nowhere mentioned.

After a two-week stopover in Philadelphia, *Princeton* arrived off Washington on February 12th. The colors were half-masted and the "Peacemaker" was fired on passing Mount Vernon; the gun was fired again, off Greenleaf Point. There was great interest in the sloop and her ordnance, in large part because of the tensions with Britain over Oregon and with Mexico over talk of annexation of Texas.

Stockton took *Princeton* on a trial cruise on the Potomac on February 15, during which the "Peacemaker" was fired three times. A series of excursions followed, the first of which was on February 17 and included President Tyler and much of the cabinet, Senators, army and navy officers, and newspaper reporters. Again "Peacemaker was fired three times. Another outing, for most of the members of the House of Representatives, some Senators, and the press, took place on February 20.[51] During these trips, "Peacemaker" was fired a total of eight times. The publicity surrounding these successful trips by the *Princeton* was useful in overcoming opposition to President Tyler's request for similar ships larger in size and more suited to carry heavy armament.[52]

Interest in *Princeton* and her guns was such that a grand outing was planned. On February 28, 1844, between 350 and 400 people of both sexes, including President Tyler and cabinet officers and their families, boarded the sloop at Alexandria. On the way down the Potomac to Mount Vernon, at about 2:20 and at a point below Fort Washington, the "Peacemaker" was fired once. It was fired again at 3:20 after the sloop had come round and was standing up river. The *Princeton*'s log notes records laconically what happened next: "At 4 to gratify the interest evinced by the Secry of the Navy, Captain Stockton determined on a third discharge of the great gun, the effect of which proved most awful."[53]

This time the gun blew up. The breech broke into large irregular fragments, just under the trunnion band. One half of the breech passed out over the starboard bow, taking with it 20 feet of the hammock netting and 12 hammocks. The other major fragment, a piece weighing about 2,000 lbs and about 5 feet long and more than half the circumference of the gun at the larger end, fell in the port gangway about 30 feet from the gun. The gun carriage was a complete wreck.[54]

The large section of the gun which fell inboard caused the casualties, mowing down the front rank of onlookers who had been standing to the left of the gun. Dead were Secretary of State (and former Secretary of the Navy) Abel Upshur, Secretary of the Navy Thomas Gilmer, and six others. Nine other people, including Senator Thomas Hart Benton and Stockton (who had fired the gun) were injured.[55] President Tyler, who had remained below, escaped injury.[56]

Stockton requested President Tyler to convene a court of inquiry; it took place in March aboard the sloop. Stockton did not attend, informing the court by letter that he had not yet recovered from his wounds. He was, however, represented by his attorney. Ericsson refused to be involved in any way; he was convinced, not without some justification, that Stockton—who had not shared triumph with him—now wanted him to share the failure. The refusal worked to Stockton's advantage, as it could be regarded as proof of Ericsson's responsibility.

The court did find fault with the quality of the metal

49. *Niles' National Register* (March 2, 1844).

50. Ericsson's biographer Church repeats the story, which appears generally accepted. Church, *The Life of John Ericsson*, I, 140.

51. Stockton made every effort to impress his guests; this included a magnificent dinner aboard the sloop at his own expense. See the description of the February 20 outing by the correspondent for the *Ohio Statesman* quoted in Bayard, *A Sketch of the Life of Com. Robert F. Stockton*, pp. 84-86.

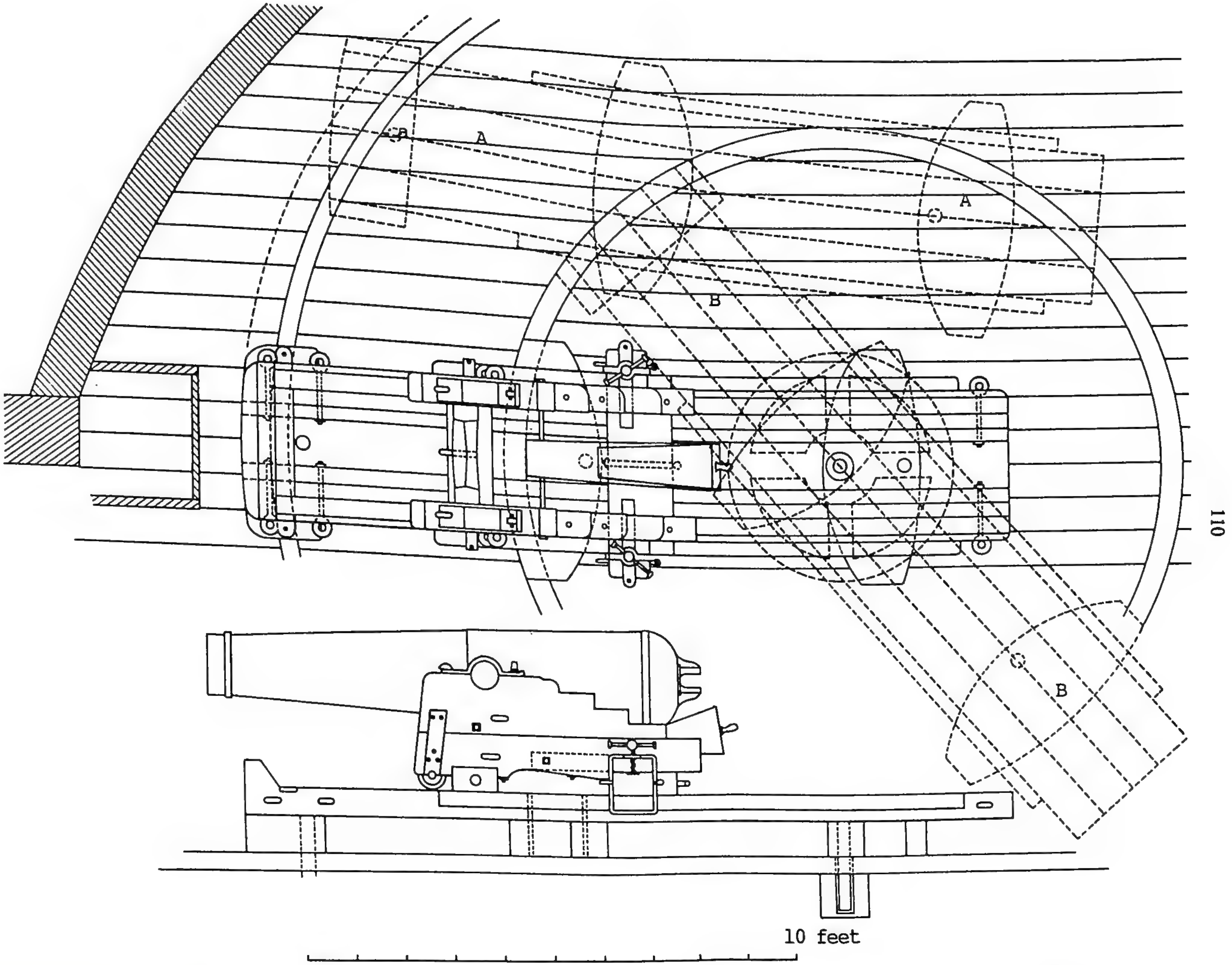
52. Among the opponents was the chairman of the House Naval Affairs Committee, William Parmenter.

53. U.S., National Archives, Record Group 45, *Princeton*, log book I.

54. *Ibid.*

55. The total of dead should really be nine. In 1846, Chief of the Bureau of Ordnance and Hydrography, Commodore Crane, resigned his post and committed suicide. His family blamed it on the "Peacemaker" tragedy.

56. Tyler remained below in the company of the attractive twenty-four-year-old Miss Julia Gardinier. Gardinier's father, a New York State senator, was among those killed.



Plan of the 8-incher and carriage as carried by the *Princeton* during the Mexican War. The carriage was fitted to the *Princeton* at the Boston Navy Yard in March 1846. Note the alternate position for the carriage and gun at AA, off the center of the deck. This was with the fighting bolt positioned forward, at point n, and the slide trained to the after end. In

in "Peacemaker" (it was not of good quality to begin with and had been further weakened by the long exposure to hot temperatures while under the trip hammer) and with the welds.[57] But all concerned were exonerated, the court finding that Stockton had been motivated by patriotic intentions.[58] The same conclusion regarding "Peacemaker" was reached in the course of a subsequent investigation by the Mechanic Arts members of the Franklin Institute. They visited the ship in early April and concluded that the metal in the gun was "decidedly bad."[59]

Stockton's exoneration was completed when President Tyler, in spite of objections raised by the House Committee on Naval Affairs, ordered a replacement gun for the "Peacemaker" to be manufactured in England under his direction.[60] This gun was fired only once, and never saw service ("Oregon" was offloaded in April but put back on the ship in late May. It was offloaded for good in July 1845.). These two guns still exist: The former is at the Washington Navy Yard, on an 1861 13-inch mortar carriage, next to the restored Commandant's House; "Oregon" is located at the U.S. Naval Academy at Annapolis.

The explosion of "Peacemaker" gave Congress an excuse to hold up construction of more steam warships, delaying the modernization of the Navy;[61] it also held up the introduction of heavy cannon aboard U.S. Navy ships, but it did not retard their development. It also led to a policy whereby the Bureau of Ordnance and Hydrography had sole responsibility for proof of naval weapons. Experiments over the next five years into metalurgical techniques and quality control resulted in higher-quality guns. Thomas Rodman, John Dahglren, and Robert Parrott all acknowledged the tragedy as a motivation to develop new ordnance.[62]

Another change brought by the explosion was a reduction in powder charges aboard U.S. Navy ships. By the time of the Civil War, the maximum allowed was 15 lbs., and this was for the XI-inch Dahlgren gun.[63] This restriction, of which Ericsson disapproved, probably enabled the *Virginia* to escape destruction in the course of her March 1862 engagement with the *Monitor.*

The "Peacemaker" explosion led to a complete break between Stockton and Ericsson, with the result that Ericsson never received full compensation for his work and patents of which the government had been given free use on *Princeton.* Ericsson only received $1,150 for his work in designing the vessel, and that had come before the break between the two men. The additional $13,390 he claimed was never honored, even though the sum was eventually authorized.[64] Ericsson vowed, as a result of this experience, never again to offer his services to the Navy Department. It was fortunate for the Union that he did not keep his vow, and he won lasting fame for the *Monitor.*

As for Stockton, he became a commodore and during the Mexican War he was a commander of the Pacific Ocean Squadron; Samuel Eliot Morison describes his exploits as "calculated to make him a popular hero,"[65] David Long notes Stockton's "aggressive

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57. Experts concluded that the gun's fibrous quality was gone and that the metal's specific gravity was less than ordinary hammered iron. See the Franklin Institute Report.

58. Naval Court of Inquiry in House Report 479, p. 12.

59. U.S., National Archives, Record Group 45, *Princeton,* log book, I, entry of April 7, 1844; and Franklin Institute Report, pp. 215-216.

60. Letter of President John Tyler to the Secretary of the Navy, March 14, 1844, in House Report 479, p. 43.

61. Samuel E. Morison, *"Old Bruin," Commodore Matthew Calbraith Perry* (Boston: Little, Brown and Co., 1967), p. 132.

62. Rodman was later a brigadier general and Chief of Ordnance of the U.S. Army. He invented the technique of casting heavy guns hollow around a core whereby they were cooled from the interior. Dahlgren, later an admiral, was the designer of the guns which were the chief naval weapons of the American Civil War and beyond. Parrott was the proprietor of the West Point Foundry and the inventor of a hooped rifle gun, bearing his name, which was extensively used during the Civil War, also at sea. See U.S. Congress, Joint Committee on the Conduct of the War, "Heavy Ordnance," in *Report of the Joint Committee on the Conduct of the War at the Second Session, Thirty-Eighth Congress* (Washington: U.S. Government Printing Office, 1865), pp. 6, 96, 114, and 136.

63. U.S., Bureau of Ordnance, Navy Department, *Ordnance Instructions for the United States Navy* (2nd ed.; Washington: G. W. Bowman, 1860), p. 141.

64. Stockton claimed that he had not solicited Ericsson's help, and that the Swede had, in fact, "thrust himself upon me." He also lied when he said he had never entered into an agreement with Ericsson that would lead to recompense by the U.S. Government for his work on *Princeton.* According to Stockton, Ericsson had simply volunteered his services. Letter from Stockton to Secretary of the Navy John Y. Mason, May 20, 1844. Quoted in full in Church, *The Life of John Ericsson,* pp. 143-145. The Naval Committee of the House of Representatives unanimously reported a bill to pay Ericsson the full sum, but it was defeated in a narrow vote of the full House. In 1848 a similar bill was defeated by an unfavorable report from the Naval Committee of the Senate. Nonetheless, payment of $13,930 was authorized by the U.S. Court of Claims in 1857. No restitution, however, was ever made.

65. Samuel Eliot Morison, *"Old Bruin." Commodore Mathew Calbraith Perry* (Boston; Atlantic, Little, Brown, 1967), p. 213.

and impulsive" manner and his "imperious attitude and antagonistic edicts" which "incensed the Mexican inhabitants." Stockton also intrigued with John C. Fremont against General Stephen W. Kearny, until Commodore James Biddle arranged his departure.[66] Still, Stockton claimed the title of "Conqueror of California." In 1850 he resigned from the Navy and served as a United States Senator from New Jersey (1851-1853).

As for *Princeton*, she was considered an unlucky ship. Indeed, Stockton's continued command and influence may have been responsible for keeping her in service. Ericsson's propeller on *Princeton* was tested against a new propeller, the "common screw" (Stevens scull). In a series of runs between mile markers with each propeller in March 1845, the common scew proved superior and was kept on the sloop for the rest of its existence."[67] The *Princeton* was in drydock at the Boston navy Yard during the first four months of 1846 for boiler work. She was part of the Home Squadron during 1845-1847; and at the end of his administration, Tyler selected Stockton and the *Princeton* to carry to Galveston the Congressional resolution annexing Texas. Her Mexican War armament was one 8-inch 55 cwt (6,160 lbs) "Paixhan" (Paixhans) pivot gun (see illustration) and eight 42-pounder carronades. Both *Princeton* and *Mississippi*, the only large steamers in the Navy, performed well and extensively in the Gulf Coast squadron during the Mexican War. The steamers proved their superiority in blockade duty by being able to maintain station during the stormy season.[68] Having been fitted with new double return-drop circular-flue boilers, *Princeton* was sent on a cruise to the Mediterranean, where she remained until July 1849. Overseas she was greeted with acclaim. Stuart noted in 1853, in relation to the Mediterranean cruise, that "It is doubtful whether her performance, considered relatively with the fuel consumed, has ever been excelled by a screw steamer."[69] The sloop certainly influenced both British and French naval design. By 1856, both navies had powerful steamers possessing her characteristics.[70] She was also very important in this country in the development of the six screw frigates launched in the mid-1850s: *Niagara*, *Roanoke*, *Colorado*, *Minnesota*, *Wabash*, and *Merrimack*. At the time, they were the best of their kind in the world.[71]

Upon her return from the Mediterranean, *Princeton's* hull was found too rotten for repair and she was broken up at the Boston Navy Yard.[72] Her machinery remained in storage at the Boston Navy Yard until the summer of 1851. *Princeton the Second*, authorized in that year, utilized such materials of the former vessel as possible (including the engines), but was an entirely different and larger vessel with a new hull designed by Samuel Pook.[73] It is unfortunate that the original *Princeton* was not preserved, and that such an important vessel should be remembered chiefly for her fatal

66. David F. Long, *Gold Braid and Foreign Relations. Diplomatic Activities of U.S. Naval Officers, 1798-1883* (Annapolis, MD: Naval Institute Press, 1988), p. 104.

67. The difference was 32 seconds in a mile or over one mile in eleven. Baxter, *The Introduction of the Ironclad Warship*, p. 14. As Baxter noted, despite the success of the screw propeller, the Navy continued to expend large amounts on experiments with submerged wheels and the construction of paddle-wheel steamers. Stuart says the propeller was replaced "at the insistence of Commodore Stockton," but notes that the "common screw" was 11.8 percent more efficient. Stuart, *The Mail and Naval Steamers of the United States*, pp. 47-48.

68. Bauer, *Surfboats and Horse Marines*, p. 165. Bayard puts it this way, "No vessel, during the Mexican war, was more useful than the Princeton in the Gulf of Mexico. The records of the Navy Department will show that she performed more service than all the rest of the Gulf squadron put together." Bayard, *A Sketch of the Life of Com. Robert F. Stockton*, p. 87.

69. Stuart, *The Naval and Mail Steamers of the United States*, p. 50.

70. Bayard, *A Sketch of the Life of Com. Robert F. Stockton*, p. 81.

71. Change came slowly in the U.S. Navy. Bennett wrote that *Princeton*'s success led a congressional committee in 1846 to investigate the whole issue of steam for naval purposes, with the recommendation that thirteen propeller steamers be built immediately. But when authorization was voted the next year for four war steamers, a board of naval officers decided that three of the four would be side-wheelers. The one screw steamer was *San Jacinto*. Bennett, *The Monitor and the Navy under Steam*, p. 28.

72. Bayard, reflecting Stockton's views, wrote: "Undoubtedly the *eclat* which Mr. Stockton obtained by his successful construction of the Princeton provoked the jealousy of some petty spirits in the navy; and soon after her return from the Mediterranean, and immediately following the resignation of his commission in the navy by Mr. Stockton, she was directed to be broken up, on the pretense that her timbers were so rotten as to render her repair impracticable; but immediately upon the election of Commodore Stockton to the Senate of the United States, she was ordered to be rebuilt. But her model was spoiled and her machinery changed, so that she in no way resembled herself as she came from the hands of her original architect. In a speech in the Senate on the navy, Commodore Stockton pronounced her, as rebuilt, 'an abortion in the service,' " Bayard, *A Sketch of the Life of Com. Robert F. Stockton*, pp. 86-87.

73. Bauer, *Ships of the Navy, 1775-1969*, p. 47. She carried the figure head of the former vessel and some of the planking (most of the latter was too decayed for use). The original *Princeton*'s bell

association with the "Peacemaker" disaster. Certainly she was an important factor in the development of the steam navy of the United States and one of the most innovative warships in naval history.

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hangs today in front of Borough Hall in Princeton. The engines for the new vessel were the original Ericssons, relined, with the addition of Sickles' adjustable cut-off. She had new boilers and a larger 16' propeller. The new *Princeton* was a clipper-built ship, 176' 8" long between perpendiculars and 1,370 tons (of 2,240 lbs.) *Drawing-Room Companion*, Vol. I, No. 30 (November 22, 1851), p. 465; Stuart, *The Naval and Mail Steamers of the United States*, pp. 108-111; and Preble, *A Chronological History of the Origin and Development of Steam Navigation*, p. 199. That there was another *Princeton* was largely a result of Stockton's influence. The new vessel was armed with a battery of 4 8-inch 58 cwt (6,496 lbs.) guns, and six medium 32-pounders of 32 cwt (3,584 lbs.). She was fitted out in 1852 as a part of Perry's Squadron to Japan, but trouble in her new boilers forced her to remain behind. She was placed in ordinary in 1857, and became a receiving ship until 1896, when she was sold.

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Naval Technology During the American Civil War

DEAN C. ALLARD

THE American Civil War traditionally is seen as the first major conflict featuring widespread application of the industrial arts that progressed so rapidly in the western world during the 19th century. This interpretation certainly applies to both of the American navies participating in that conflict. To place their roles in perspective, however, it must be recognized that the naval establishments of the United States and the Confederate States of America typically adapted existing technology, instead of creating entirely new concepts. Further, the achievements of the North and South often had limited impact in the long run. This was especially the case since the remarkably swift change of technology in the mid 19th century made many of the Civil War systems obsolete within a very few years.[1]

Comprehension of the nature of Union and Confederate technology also requires an understanding of the distinctive nature of Civil War combat. The Union Navy operated extensively on inland and coastal waters, especially in combined operations with Army. It also maintained a blockade of the long, southern coastline. The South never developed a major fleet, but it did have a considerable ability to defend its rivers and harbors. At the same time, the Confederacy undertook a classic *guerre de course* campaign against northern merchant shipping. The lessons of all of these operations were noted by European navies, as was seen, for example, in the French Jeune Ecole movement of the 1880s. Yet, the absence of classic fleet actions on the high seas, fought for the control of the seas, meant that the American Civil War was somewhat extraneous to the concerns of the major naval powers.[2]

In tracing the technology of this conflict, a standard starting point is the celebrated action that took place in Hampton Roads, Virginia, during the spring of 1862. On 8 March of that year, the Confederate ship *Virginia*, formerly the Union Navy's *Merrimack*, sailed from Norfolk to attack the wooden blockading vessels of the Union Navy. In 1861, northern officials burned *Merrimack* to the waterline and scuttled her when it became evident that the Confederates would capture the ship. But, her hull was sound and the South converted the hulk into a formidable ironclad warship designed primarily by a former U.S. Naval officer, John Mercer Brooke. Reflecting one of the configurations of ironclads generally accepted by world ship designers, the vessel featured an armored, sloping casemate mounting a battery of rifled and smooth bore guns. She was entirely dependent upon steam engines, which drove a single screw, for her propulsion. In addition, *Merrimack* carried a ram in her bow.[3]

During her initial action on the 8th of March, this ram was responsible for sinking the sailing warship *Cumberland*. Later, the smooth-bore explosive shell guns of *Merrimack* destroyed a second wooden vessel, the Union frigate *Congress*. Against *Merrimack*'s own iron sides, the guns of the northern fleet were entirely ineffective.

With dramatic timing, one of the Union Navy's pioneering ironclads, the *Monitor*, reached Hampton Roads within hours of *Merrimack*'s assault on the blockading fleet. This vessel, designed by the famed Swedish-American inventor John Ericsson, was similar to *Merrimack* in being screw propelled and without auxiliary sails. But, in other respects, she stood in stark contrast to the Confederate vessel. Displacing

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1. See, for example, Melvin Kranzberg and Carroll W. Pursell, Jr., eds., *Technology in Western Civilization* (New York: Oxford University Press, 1967), p. 497; Theodore Ropp, *War in the Modern World* (New York: Collier Books, 1962), p. 161; and William N. Still, Jr., "Technology Afloat," *Civil War Times Illustrated* (November 1975), pp. 5-9, 40-47.

2. Ropp, *War in the Modern World*, p. 194; Stanley Sandler, *The Emergence of the Modern Capital Ship* (Newark: University of Delaware Press, 1979), pp. 118-19.

3. William N. Still, Jr., *Iron Afloat: The Story of the Confederate Ironclads* (Nashville: Vanderbilt University Press, 1971), pp. 13-29; George M. Brooke, Jr., *John M. Brooke: Naval Scientist and Educator* (Charlottesville: University Press of Virginia, 1980), pp. 234-54.

less than 1,000 tons, she was approximately one fourth the size of *Merrimack*. *Monitor*'s low freeboard, designed to present as small a target as possible to enemy fire, also was distinctive. Her ordnance, consisting of two smooth-bore eleven-inch guns developed by John A. Dahlgren, was mounted in a centerline turret, instead of in the armored casemate featured by *Merrimack*. Turrets were especially useful to vessels operating in restricted waters, due to the limits placed on their maneuverability. The fact that *Monitor* was designed for coastal use may have influenced that feature of her design.[4]

On 9 March, *Monitor* and *Merrimack* met in history's first action between ironclad warships. During a grueling engagement, *Merrimack*'s attempts to ram John Ericsson's vessel were frustrated by her inadequate engines which limited the ship's maneuverability. But, the powerful ordnance carried by both vessels scored repeated hits on the enemy, often at point-blank range. Remarkably, neither vessel had her armor pierced. *Merrimack,* however, was forced to leave the field of battle due to other damage that she suffered from the effects of *Monitor*'s gunfire. Because of her withdrawal, *Monitor* is considered the victor in the Battle of Hampton Roads.

One famous historian, Bernard Brodie, commented that it was the "uselessness of [*Monitor*'s and *Merrimack*'s] long and furious cannonade, contrasted with the signal victories" of *Merrimack* over unarmored ships on the previous day, that made this action a "landmark in the story of the warship."[5] In Europe, these events created great popular enthusiasm for ironclads. But, for the world's admiralties, it was clear that *Monitor* and *Merrimack* were far from being new. In fact, as James Phinney Baxter demonstrated many years ago, in 1862 more than a hundred iron and ironclad ships were completed or building throughout the world. Thus, for naval professionals, as Baxter aptly stated, the significance of the ships engaged in Hampton Roads was that they "did not initiate the great revolution in naval architecture, they crowned it."[6]

Authorities in the major navies were impressed, however, by particular aspects of the battle. Of special interest was *Monitor*'s status as the first ship in the world to carry a centerline revolving turret. Even though the guns it contained were traditional, muzzle-loading smoothbores, the turret was to have a revolutionary effect on future ship design. As was true for the ironclad itself, this concept was not new in 1862. Turrets had been discussed for a number of years and one of their proponents, Captain Cowper Coles of the British Navy, obtained a patent in 1859 for a hand-turned turret mounted on a roller path that probably was superior to the one developed by John Ericsson. By the spring of 1862, construction of a turret ship using Coles's design was authorized by the Royal Navy. Nevertheless, the first practical demonstration of the turret in action occurred in Hampton Roads. This celebrated action received worldwide attention and hastened the adoption of turrets in future warships.[7]

Monitor's distinctive, low-lying configuration was imitated in ships acquired later for coastal defense purposes by the navies of Russia, Spain, Turkey, and other powers. Unlike the turret, however, this silhouette was not a central feature in the successful seagoing ironclad, which would be a high-freeboard vessel. The problem with low freeboard ships—their limited reserve buoyancy and lack of stability at high angles of heel—was demonstrated by *Monitor* herself in December 1862. At that time, while under tow off the coast of North Carolina, Ericsson's vessel foundered and sank.[8]

Insofar as *Merrimack*'s technological significance is concerned, the cast-iron rifles that were a prominent part of her armament illustrated the gradual abandonment by European navies of the smooth bore cannon. These particular weapons, featuring reinforcing bands of wrought iron at the breech, were designed by John Mercer Brooke. European advances in breech loading rifles, however, were not reflected in these muzzle loaders.[9] Another distinctive element was *Mer-*

4. For *Monitor* and her engagement with *Merrimack,* see, for example: Bern Anderson, *By Sea and By River: The Naval History of the Civil War* (New York: Alfred A. Knopf, 1962), pp. 67-77; William N. Still, Jr., "The Historical Importance of the USS Monitor" (unpublished paper in author's possession); John W. Oliver, *History of American Technology* (New York: The Ronald Press Co., 1956), pp. 282-83; and William C. Church, *The Life of John Ericsson* (New York: Charles Scribner's, 1890).

5. Bernard Brodie, *Sea Power in the Machine Age* (Princeton: Princeton University Press, 1941), p. 171.

6. James Phinney Baxter, *The Introduction of the Ironclad Warship* (Cambridge: Harvard University Press, 1933), p. 285.

7. Baxter, *Introduction of the Ironclad Warship*, pp. 185-95, 311; Still, "The Historical Importance of the USS Monitor."

8. Still, "Technology Afloat," p. 42.

9. Warren Ripley, *Artillery and Ammunition of the Civil War* (New York: Van Nostrand Reinhold Co., 1970), pp. 127-36; Sandler,

rimack's ram bow. Although this concept was championed for a number of years by naval architects in Europe and the United States, especially as a means of circumventing the armor carried by the new ironclads, *Merrimack*'s sinking of *Cumberland* represented the first successful use of the ram in modern history. It sometimes is forgotten that, since *Cumberland* was anchored, she was particularly vulnerable. Further, many later ramming attempts during the American Civil War failed. Nevertheless, *Merrimack*'s achievement, combined with the equally celebrated ramming and sinking of an Italian warship by the Austrians in the 1866 Battle of Lissa, explain much of the fascination that the world's navies had with this tactic over the next several decades.[10]

Whatever novelty, or lack of novelty, was demonstrated by *Monitor* and *Merrimack,* many of their characteristics were reflected in other vessels built by the North and South. Certainly, this applies to the numerous monitors built in the North after the events in Hampton Roads engendered widespread enthusiasm for this type of ship. The later monitors became progressively larger and more heavily armed, including vessels that eventually displaced more than 4,000 tons. Some mounted 15-inch Dahlgren guns capable of firing projectiles weighing 440 pounds each. Several 20-inch Dahlgren smooth bores were completed after the Civil War, but never deployed afloat. The monitors also carried laminated side armor protection, consisting of cast and wrought iron plates, up to eleven inches thick. Considerable efforts were made, with partial success, to improve the seakeeping abilities of the later monitors. In 1866, one of these vessels, *Monadnock,* reached the American West Coast after a passage around Cape Horn. In the same year, *Miantonomah* crossed the Atlantic to visit European ports.[11]

In the protected waters where most naval actions took place during the Civil War, the monitors were extremely useful. Enemy rifled or smooth bore guns failed to penetrate their armor, even though the force of enemy rounds could result in other types of structural damage. The strength of these vessels was demonstrated during Admiral Samuel F. DuPont's unsuccessful attempt in April 1863 to defeat the forts guarding the approaches to Charleston, South Carolina. Here, each of the seven monitors in DuPont's force took scores of hits from southern shore batteries. Yet, only one ship required immediate yard overhaul and but a single man lost his life.[12]

The guns mounted by the monitors, typically 9, 11, and 15-inches in caliber, were designed by the famed ordnance inventor, John A. Dahlgren. Originally intended primarily to fire explosive shells, especially against wooden ships, these soda-bottle shaped weapons often are considered the ultimate smoothbore cannon. Dahlgren also was well aware of the rifled breech and muzzle-loaders being developed in Europe, but he felt that those weapons were unsafe, a position which later earned Dahlgren a great deal of criticism. Nevertheless, there is little doubt that at the short ranges typical of the Civil War, large smooth bore cannon firing solid shot were more effective than rifles in attacking enemy ironclads. During one well known action in 1863, this was demonstrated when the monitor *Weehawken* hit the Confederate ironclad *Atlanta* with four 15-inch non-explosive rounds from a distance of about 300 yards. In one of the rare instances in which armor was pierced, two of these rounds wrecked the southern ship's interior, forcing her to surrender within a few minutes. Monitor guns were notoriously slow firing and hence did not produce a heavy volume of fire. Yet, monitors firing a combination of solid shot, non-explosive hollow rounds, and explosive projectiles, were used in conjunction with faster firing broadside ships to wreak havoc ashore. An excellent example occurred later in 1863 when Fort Sumter in Charleston Harbor was demolished by a force that included a number of monitors. In January of 1865, the guns of these ships also participated in the capture of Fort Fisher. The surrender of that position led to the sealing of Wilmington, North Carolina, the South's last major open port.[13]

In addition to the monitors, used particularly in coastal waters, the Union Navy developed ironclad gunboats for the nation's western rivers. The first of these were vessels of the *Cairo* class which were built in 1861 at St. Louis in the commercial yard of John Eads. These vessels were personally endorsed by President Abraham Lincoln who had a keen interest in

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Emergence of the Modern Capital Ship, pp. 89-93; Oscar Parkes, *British Battleships* (London: Seeley Service and Co., 1966), pp. 34-37.

10. Brodie, *Sea Power in the Machine Age,* pp. 85-86.

11. K. Jack Bauer, *Ships of the Navy, 1775-1969* (Troy: Rensselaer Polytechnic Institute, 1970); U. S. Naval Historical Center, *Dictionary of American Naval Fighting Ships* (Washington: GPO, 1959-1981), 8 volumes.

12. E. B. Potter, ed., *Sea Power: A Naval History* (Englewood Cliffs: Prentice Hall, 1960), pp. 313-14.

13. *Ibid.*, pp. 273, 315, 324-25; Ripley, *Artillery and Ammunition of the Civil War,* pp. 87-107; David K. Allison, "John A. Dahlgren:

any type of machinery and longstanding appreciation of the value of ironclads.[14] Their shallow draft, broad beam, and paddle wheels indicated that these vessels were adaptations of the commercial steamboats long in use on the Mississippi River. But, Union Naval designers also introduced more advanced features, notably the addition of sloping armored casemates which provided partial protection for ordnance and engineering spaces. Further, the paddle wheel was placed in the center of the hull in order to provide protection against enemy fire. Later river gunboats included some that featured screw propellers and excellent turrets designed by John Eads. The utility of all of these classes in attacking or running by enemy shore fortifications was demonstrated repeatedly in the combined Army-Navy western campaigns of the Civil War.[15]

Early in the conflict, one element within the Navy also called for the building of seagoing ironclads. The proponents included John Lenthall, the Navy's chief constructor, and Benjamin Franklin Isherwood who was the North's ranking steam engineer. Behind their recommendations lay the possibility that French and British support of the southern cause could lead to a war between those powers and the United States. The ships that Lenthall and Isherwood had in mind were intended for such a conflict.[16]

Low priority was given to the construction of these oceanic vessels. In part, this reflected the decreasing likelihood of war with the major European powers. In addition, there was considerable pessimism within U. S. Naval circles regarding the feasibility of developing a practical ocean-going ironclad. Nevertheless, two successful ships in this category were built. They are of interest since they represent American participation in the world-wide quest for the modern capital ship that eventually culminated in the completion of the famed HMS *Devastation* in 1873.

One of these American vessels was *New Ironsides*, a 4,100 ton armored casemate ship with her guns mounted on the broadside. She was very similar to the French *Gloire*. *New Ironsides* probably saw more days in combat during the Civil War than any other Union vessel and was fully capable of operating on the high seas. Her actual operations, however, were in relatively restricted coastal waters, including extended blockading cruises, participation in the 1863 attack on Charleston, and the later operation against Fort Fisher, North Carolina.[17]

The other example was the ram *Dunderberg*. Designed by John Lenthall, she was especially large for her day, with a length of 377 feet and a displacement of more than 7,000 tons. She had a 50-foot solid oak ram. Originally designed to include two centerline turrets, as well as a casemate, the turrets were deleted during the ship's construction. This advanced ship could well have been the proud centerpiece of the post-war Union Navy. Yet, after 1865 there was a rapid decline in military expenditures and interest in the United States. At that time, the still incomplete vessel was returned by the government to her private builder, who proceeded to sell *Dunderberg* to France. She served for a number of years in the French Navy, carrying the appropriate name of *Rochambeau* in honor of one of the French heroes in the American Revolutionary War.[18]

In addition to ironclads, there were many classes of wooden ships that made significant contributions in combat. In fact, those vessels made up the vast bulk of the Union Navy. One of the most famous examples was *Kearsarge*, the bark-rigged screw sloop-of-war whose 11-inch Dahlgren guns, firing explosive shells, sank the famed Confederate raider *Alabama* off the coast of France in 1864. Other classes were specifically adapted to operate on the South's rivers and harbors. They included the double-ender gunboats propelled by paddle wheels and with rudders at both the bow and the stern. The double-enders had maximum maneuverability in restricted waters. A further example of a wooden craft that was well adapted for inshore operations were simple raft-like boats mounting 13-inch mortars that normally fired explosive shells against

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Innovator in Uniform," pp. 26-45 in *Captains of the Old Steam Navy*, ed. James C. Bradford (Annapolis: Naval Institute Press, 1986).

14. John D. Milligan, "From Theory to Application: The Emergence of the American Ironclad War Vessel," *Military Affairs* (July 1984), pp. 126-32; Robert V. Bruce, *Lincoln and the Tools of War* (Indianapolis: Bobbs-Merrill Co., 1956), pp. 172-73.

15. Bauer, *Ships of the Navy*, pp. 85-88. See also John D. Milligan, *Gunboats Down the Mississippi* (Annapolis: United States Naval Institute, 1965).

16. Edward William Sloan, III, *Benjamin Franklin Isherwood: Naval Engineer* (Annapolis, United States Naval Institute, 1965), pp. 52-55.

17. U. S. Naval Historical Center, *Dictionary of American Naval Fighting Ships*, vol. V, 58-59.

18. Bauer, *Ships of the Navy*, p. 76; Stanley Sandler, "A Navy in Decay: Some Strategic Technological Results of Disarmament, 1865-1869 in the U. S. Navy," *Military Affairs* (December 1971), pp. 140-41. There also was a third seagoing ironclad in this program. This was *Roanoke*, which was a failure. See Still, "Technology Afloat," p. 47.

land targets. Although ungainly, these craft participated in numerous campaigns. For example, they received major credit for silencing Fort Jackson in 1862. That position was one of the major fortifications protecting the Mississippi River approaches to New Orleans. The mortar vessels also contributed to the intense bombardment of Vicksburg, Mississippi, during the 1863 campaign resulting in the capture of that key Confederate position.[19]

Virtually all of the Union Navy's ships had steam plants serving as their primary or secondary means of propulson. Fortunately for the North, the highly competent Benjamin Franklin Isherwood was the Chief of its Bureau of Steam Engineering. In this era, steam plants were very inefficient and oceanic vessels still depended heavily on sails. Yet, in the narrow coastal and inland waters representing the typical marine battlefields of the Civil War, sails often were not feasible. Hence, the work of Isherwood was particularly important.[20]

Isherwood personally designed the propulsion machinery for 125 vessels, supervised the construction of plants for many additional ships, and oversaw the Navy's Engineering Corps which was responsible for operating all of the Union's steam plants. He is noted as being one of the pioneers in using forced-draft combustion in boilers, probably due to the need to develop speedy vessels capable of intercepting Southern blockade runners. Yet, his overall reputation does not rest on innovation. Instead, Isherwood was a practical engineer who stressed the need for reliability. For this reason, he specified machinery with exceptional strength and capacity. He also was famous as an experimentalist, especially in rejecting the application of a theory attributed to the French 17th century scientist, Edme Mariotte. Mariotte's law held that maximum efficiency and range could be had by making full use of the expansive properties of steam. Later in the 19th century, when metallurgical and other improvements allowed the use of high-pressure, high-temperature steam in long-ranged double or triple expansion engines, Mariotte's propositions were proven correct. But, Isherwood's experiments with the engineering apparatus actually available in the Civil War era, including direct competitions with plants based on Mariotte's principles, led him to conclude that the most efficient results came from the relatively low use of steam expansion. Because of this design philosophy, and Isherwood's effective management of the Navy's Engineering Corps, Union steam plants were highly dependable. As a later American naval engineer summarized his achievement, Isherwood's engines "did not break down and they carried our ships to victory."[21]

In one famous instance, Isherwood sought to push existing steam technology to its extreme limits. Early in the war, he obtained approval for the construction of the *Wampanoag* class of large wooden cruisers. Although obviously intended to attack the mercantile fleets of France and Britain in the event of a war with these powers over their support of the Confederacy, the ships were not completed until after the Civil War. Nevertheless, Isherwood lavished his attention on the lead ship in the class, in an effort to make her the fastest ship in the world. Early in 1868, when *Wampanoag*'s sea trials were held, she met Isherwood's expectations by maintaining a sustained speed for a period of 38 hours of almost 17 knots, which was four knots faster than any other steam vessel of that day. This feat was accomplished, however, by sacrificing other qualities essential for a successful cruiser. No less than 84% of *Wampanoag*'s usable displacement was absorbed by the weight of her engines, boilers, and coal supplies, leaving little available capacity for ordnance, storage, or crew. *Wampanoag*'s steram plant also was relatively short ranged and her auxiliary sail plan provided poor sailing performance. In a single-minded search for speed, the usually pragmatic Isherwood obviously overreached himself.[22]

Insofar as the South's shipbuilding program was concerned, the Confederacy mounted an effort that was surprisingly large and sophisticated, especially in light of its very limited industrial capacity. In all, approximately 150 ships were laid down within the southern states and about a third were completed Since the South made a conscious effort to offset its numerical inferiority by developing advanced ships, 22 of these vessels were ironclads. Most of them featured

19. Bauer, *Ships of the Navy*, 53; Sloan, *Benjamin Franklin Isherwood*, pp. 30-31; Bruce, *Lincoln and the Tools of War*, pp. 156-66.

20. For accounts of Isherwood, see Sloan, *Benjamin Franklin Isherwood;* Frank M. Bennett, *The Steam Navy of the United States* (Pittsburgh: Warren and Co., 1896); and Dean C. Allard, "Benjamin Franklin Isherwood: Father of the Modern Steam Navy," pp. 301-22 in *Captains of the Old Steam Navy*, ed. James C. Bradford *Age*, pp. 269-70, refers to Russian mine warfare in the Crimean War.

21. George W. Melville quoted in Allard, "Benjamin Franklin Isherwood," p. 306. For forced draft combustion, see Oliver, *History of American Technology*, p. 287.

22. Allard, "Benjamin Franklin Isherwood," pp. 309-13.

an armored casemate and heavy ram similar to those seen in *Merrimack*. There also were more unusual vessels, such as the turtleback ram *Manassas,* whose lines are reminiscent of the modern nuclear submarine. *Manassas* depended almost exclusively upon a ram bow to inflict damage on the enemy. Her effectiveness became evident in September 1861 when she helped drive off a blockading squadron at the mouth of the Mississippi River.[23]

The South depended more heavily than the North upon rifled ordnance, most notably as seen in the large muzzle-loading guns developed by John Mercer Brooke. The best known were 7 and 6.4-inch weapons with characteristic reinforcing bands of wrought iron at the breech. The rifle, of course, soon became the standard weapon of the world's navies. Yet, as previously noted, the smooth bore cannon was still superior during the Civil War, especially at the limited ranges typical of that conflict. The basic problem with the rifle of this period was its lack of strength. It was only after the Civil War that metallurgical improvements and the development of slow burning powders led to the greatly increased muzzle velocities that finally established the superiority of the rifle.[24]

There is no doubt that the South was inferior to the Union in other engineering areas. For example, the steam plants of the Confederate vessels, many of which were second hand, were plagued with engine breakdowns and even under the best of circumstances were inferior to northern vessels in maneuverability, speed, and reliability. Additional mechanical problems also were common. Some of these were exemplified in *Tennessee,* which probably was the best of the Southern ironclads. During the Battle of Mobile Bay, Admiral Farragut's squadron, including two 15-inch monitors and two Eads-designed river monitors mounting 11-inch Dahlgrens in twin turrets, surrounded this powerful ram. With only one partial exception, none of the Union rounds penetrated *Tennessee*'s armor. But the North's overwhelming firepower battered the ram's casemate until it almost collapsed. In addition, *Tennessee*'s exposed rudder chains were severed and some of her poorly designed gunport shutters jammed closed. in the face of all this damage, the Confederate ship was forced to surrender.[25]

In general, the key strategic role of the Confederate Navy was to defend its own rivers and harbors. As was demonstrated at Mobile Bay, this task often was frustrated by the South's relative technical inferiority, as well as by the North's preponderance of force. But, the modern authority on the Confederate Navy, Professor William N. Still, concludes that the Southern ironclads played a key role. Still particularly notes that they delayed and sometimes entirely prevented the capture, at least by naval forces of key Confederate ports, including Richmond, Savannah, Charleston, Wilmington, and Mobile.[26]

In addition to building its own vessels, the Confederacy acquired ships from European yards which had a more offensive mission. The most famous was the cruiser *Alabama,* built by the firm of William Laird at his yard near Liverpool, England. She was constructed of wood and depended heavily upon sails for extended operations, although she had a steam engine that provided short-range speed and maneuverability. Despite her lack of technical novelty, *Alabama* and her sister raiders undertook a ruinous campaign against northern merchant shipping. The strategic objective of these operations, which was to force the Union to divert forces from its blockade, failed. Nevertheless, the Confederate raiders destroyed about 110,000 tons of American shipping and the threat they posed forced American shipowners to transfer 800,000 additional tons to neutral flags. The once proud American merchant marine, previously second only to the mercantile fleet of Great Britain, never recovered from that blow.[27]

The Confederacy also sought to purchase a number of ironclad rams in Europe that were designed to challenge and destroy the Union blockade. Particularly well known examples were the vessels that southern officials ordered from the firm of William Laird in England and the Arman Shipyard in Bordeaux, France. Southern efforts to assure the delivery of the Laird ships were frustrated by the skilled diplomacy of the U.S. Minister to London, Charles Francis Adams. The United States also blocked the transfer of one of the Arman-built rams. But, a second ram built at this yard, the *Stonewall,* a twin-screwed vessel carrying a powerful 300-pounder rifle in the bow, fell into enemy

23. William N. Still, Jr., *Confederate Shipbuilding* (Athens: University of Georgia Press, 1969), pp. 21, 80; Anderson, *By Sea and By River,* p. 117.

24. Brodie, *Sea Power in the Machine Age,* pp. 189-92; Ripley, *Artillery and Ammunition of the Civil War,* pp. 87-107.

25. Still, *Iron Afloat,* pp. 101, 193-211.

26. *Ibid.*, pp. 227-29.

27. Ropp, *War in the Modern World,* p. 194.

hands. To the relief of the Union, *Stonewall* did not arrive in the Western Atlantic until the spring of 1865, by which time the southern cause was lost.[28]

Since the Laird and Arman firms were in the front rank of naval contractors for the two leading navies of the world, one could presume that the ships they built posed a formidable threat to the Union. But, it now appears that northern alarm over these vessels was not entirely justified. In 1867, Charles Francis Adams observed one of the completed Laird rams, then a vessel in the Royal Navy, during a fleet review. Reflecting the extreme rapid development of technology in this period, Adams described her as a "mean little thing" which may not have been worth his concern when the South sought to acquire her during the Civil War.[29] This low opinion was shared by the ram's Royal Naval crew, which complained of her poor seakeeping abilities. The Confederate crew of the French-built *Stonewall* also criticized their ship. For example, during moderate seas, they reported the flooding of her forward gun and ammunition storage space. Due to the ram's limited coal supply, she had only a five-day steaming range. Further, her auxiliary sails provided indifferent results. Based upon all of these reports, two modern scholars conclude that northern fears of *Stonewall*'s potential were "much ado about nothing."[30]

In addition to referring to the major ship, ordnance, and engineering systems of the Civil War navies, any discussion of technical innovation must address underseas weapons and especially the mines and torpedoes developed by the Confederate Navy. There was a growing interest throughout the world in using these weapons against ironclad ships, which had become relatively impervious to gunfire. The South's special attraction to mines and torpedoes is not surprising, since these devices traditionally are depended upon by weaker naval powers waging a defensive war and seeking to maximize their fighting strength at minimal cost. For the South, mines and torpedoes were ideal adjuncts to ironclads in the protection of their home waters. Confederate leaders probably also were inspired by the previous work of a long line of American underseas warfare pioneers, including David Bushnell, Robert Fulton, and Samuel Colt. In addition to the accomplishments of American inventors, European developments, especially Russian mine warfare operations during the Crimean War, were known to many Americans. One individual who was particularly well informed was the Confederate President, Jefferson Davis. As the U. S. Secretary of War in the 1850s, Davis received a special report on the Russian experience written by an American Army engineer.[31]

The South's initial mine specialist was the famed oceanographer Matthew Fontaine Maury. Early in the war, after resigning his U. S. Naval commission to join his native South, he developed a laboratory, as well as an operational center to train other specialists. Maury especially was interested in developing electrically detonated mines, but was hampered in these efforts by a lack of necessary equipment. Under these circumstances, the first weapons he deployed were drifting mines with contact fuses. In the spring of 1862, Maury went to England to continue his work with underseas weapons. The results were reported back to southern officials and probably contributed to their decision later in 1862 to become the first nation to establish special mine bureaus within the navy and the army. As one historian has noted, the institutionalization of mine warfare within the military establishment was essential for the future development of this mode of warfare.[32]

Among the other men who worked in the field after Maury's departure to England were Beverly Kennon, a lieutenant in the Confederate Navy, and Gabriel J. Rains, an Army officer. Kennon developed floating mines, consisting of modified glass jars filled with gunpowder, that were designed to explode upon mechanical contact with an enemy ship. In December 1862 two of these primitive devices sank the ironclad river gunboat *Cairo* on the Yazoo River in the state of Mississippi. *Cairo* appears to be the first major warship in history to become the victim of mines and this

28. See Lynn M. Case and Warren F. Spencer, *The United States and France: Civil War Diplomacy* (Philadelphia: University of Pennsylvania Press, 1970); and Wilbur Devereux Jones, *The Confederate Rams at Birkenhead: A Chapter in Anglo-American Relations* (Tuscaloosa: Confederate Publishing Co., 1961).

29. Quoted in Jones, *The Confederate Rams at Birkenhead*, p. 119.

30. Case and Spencer, *The United States and France*, pp. 471-79.

31. See Alex Roland, *Underwater Warfare in the Age of Sail* (Bloomington: University of Indiana Press, 1978), chapters 11 and 12; Milton F. Perry, *Infernal Machines: The Story of Confederate Submarine and Mine Warfare* (Baton Rouge: Louisiana State University Press, 1965); Brodie, *Sea Power in the Machine Age*, pp. 262, 272-74.

32. Roland, *Underwater Warfare*, pp. 150-57, 179-182; Frances Leigh Williams, *Matthew Fontaine Maury: Scientist of the Sea* (New Brunswick: Rutgers University Press, 1963), pp. 374-94, 411-12, 415-19.

incident obviously stands as a landmark in the history of underseas warfare. Rains developed other types of devices, including floating keg mines and the so-called frame mine. The explosive charge for the latter weapon was contained in a hollow 15-inch shell, fixed in a heavy frame crib and maintained just below the water's surface. Both the keg and the frame mines saw extensive use in the Civil War.[33]

Later in the war, the Confederates were able to build electric mines, controlled by observers based ashore, similar to the weapons that first commanded Matthew Fontaine Maury's attention. One of the major fields of these devices was in the James River approaches to Richmond. Here, in 1864, the Confederates scored their first success with a galvanic mine when one of them destroyed the river gunboat *Commodore Jones*.[34]

In comparison to the Crimean War, when Russia's anti-ship mines damaged only two enemy vessels, the Confederates scored remarkable successes with mines. Throughout the Civil War these weapons sank no less than 29 ships and craft and inflicted some degree of damage to 14 other units. Most of the sinkings occurred late in the Civil War at a time when the North was compelled to undertake assaults against the inner ports of the Confederacy in order to improve the blockade. In addition to these results, the deterrent effect of southern underseas weapons must be considered. Enemy minefields, for example, were one of the factors explaining the failure of the Union Navy to seize Charleston.[35]

A weapon related to the mine was the spar torpedo, an explosive charge mounted on a long extension from a vessel's bow. These could be detonated against the unarmored underwater hulls of enemy ships, either upon contact or by the command of the attending crew. A particular leader in this field was a Confederate Army officer serving in the Charleston area, Francis D. Lee. Lee is credited with inventing the spar torpedo and for mounting this weapon on cigar-shaped, steam-propelled craft that operated in semi-submerged condition to minimize the target area. Appropriately, these craft were called Davids, since their objective was to use cleverness and stealth in attacking the Goliath-like vessels that blockaded Charleston throughout the Civil War. The Davids may be seen as the predecessor to the boats developed later in the 19th century to deploy self-propelled torpedoes.[36]

On the night of 5 October 1863, one of the Davids was successful in approaching the formidable Union ironclad *New Ironsides*. The Confederate spar torpedo exploded against the ship's underwater hull and the resulting explosion inflicted severe structural damage to the blockader. *New Ironsides* was out of service for almost a year while undergoing repairs. The famed ordnance inventor, John Dahlgren, who at this time commanded the Union blockade in the Charleston area, gave an apt description of the significance of this incident. He wrote:

> Among the many inventions with which I have been familiar, I have seen none which have acted so perfectly at first trial. The secrecy, rapidity of movement, control of direction, and precise explosion indicate, I think, the introduction of the torpedo element as a means of certain warfare. It can be ignored no longer.[37]

In addition to developing torpedo boats, the Confederates had considerable interest in the submarine. As was true for the Davids, they were intended to counter the Union blockade. The most famous of the southern submarines was built at Mobile, Alabama in 1863 and eventually named *H. L. Hunley* in honor of one of her designers. She was a craft of about 35 feet converted from an angular steam boiler, equipped with ballast tanks, and originally designed to tow a floating mine at the end of a long line. Later fitted with a spar torpedo similar to the one used by the Confederate Davids, the submarine was manned by a crew of nine men, eight of whom manner her hand-propelled screw. In the summer of 1863, this craft was shipped by rail to Charleston to undertake operations against Union ships in that area. But, her unsuitability for submerged operations was soon revealed. On two occasions, she sank, taking with her the lives of twelve men. Thereafter, Confederate authorities decided to operate *H. L. Hunley* on the surface in an awash condition. It was in that mode that, on the night of 17 February 1864, the craft approached the wooden blockader *Housatonic* off Charleston. The explosion of the 65-pound charge at the end of her spar against the ship's hull sank

33. Perry, *Infernal Machines*, pp. 20-36.

34. *Ibid.*, pp. 112-13.

35. Figures on mine successes vary somewhat. Those used in this paper are based on the list in *Ibid.*, pp. 199-201. For overall appraisals of the mine campaign, see *Ibid.*, pp. 195-96 and Roland, *Underwater Warfare*, pp. 166-82. Brodie, *Sea Power in the Machine Age*, pp. 269-70, refers to Russian mine warfare in the Crimean War.

36. Still, *Iron Afloat*, pp. 104-05, 112-16; Perry, *Infernal Machines*, pp. 50, 64-72, 89, 122-23.

37. Quoted in Perry, *Infernal Machines*, p. 84.

Housatonic immediately. The attacking submarine, however, also was lost in this attack.[38]

Since the Union normally did not need to defend its rivers and harbors, or oppose an enemy blockade, it had much less reason to employ underseas weapons. Nevertheless, in 1861 Union interest in countering *Merrimack,* and President Lincoln's personal support of submarines, led northern officials to contact Brutus de Villeroi, formerly a resident of Nantes, France, who now lived in Philadelphia. Villeroi had developed a small commercial submarine, featuring its own oxygen generating device. French inventors in the era had a special interest in submarine navigation and already were building *Le Plongeur,* often described as the world's first practical underseas craft. Villeroi agreed to design a submarine for the Union Navy. But the inventor and the submarine's shipbuilder soon had disagreements that led Villeroi to disassociate himself from the project. The resulting boat, named *Alligator,* was unsatisfactory and apparently never made underwater cruises. In 1863, she was lost at sea while under tow.[39]

The Union was more successful in developing surface craft equipped with spar torpedoes. In October 1864, Lieutenant William B. Cushing commanded one of these craft. Approaching the Confederate ironclad *Albemarle* in the Roanoke River of North Carolina, Cushing boldly maneuvered the boat over a log protective boom and exploded his torpedo below *Albemarle*'s armor belt. The Confederate ship sank immediately. As had been true during *H. L. Hunley*'s attack on *Housatonic,* the attacking boat was destroyed in the process. It was becoming increasingly clear that spar torpedo craft posed grave dangers to their own crews, as well as their chosen victims. The ultimate solution to this problem, of course, lay in the development of practical, self-propelled torpedoes after the Civil War.[40]

The rich variety of weapons used in the Civil War is impressive. The ironclads deployed by both sides reflected the ability of Americans to stay abreast of one of the major revolutions underway in the world's major navies. In making pioneering use of the ram bow and the centerline turret, and in demonstrating the effectiveness of mine, torpedo, and submarine warfare, the American navies also proved that they could be in the vanguard of technology. In theory, the Civil War also should have demonstrated the superiority of rifled ordnance and high efficiency steam plants. In this transitional era, however, smooth bore cannon, often firing solid shot, and machinery using the low steam expansion principle, proved superior. In looking at another part of the technological spectrum, the continuing value of wooden ships, sometimes dependent upon sail power or old-fashioned paddle wheels, was obvious. Examples included the double-ender gunboats and mortar craft that were specially adapted to the restricted water battlefield of the American theater of war.

All of this activity is consistent with American tradition of solving problems with whatever means are at hand. It is also appropriate to note that one of the tools available to Confederate and Union innovators was their knowledge of the dramatic technical advances taking place in Europe. In fact, American skill in importing concepts from abroad, combined with American pragmatism in finding answers to the special problems posed by the Civil War, explain why this conflict was such a rich testing ground for the technology of modern war.[41]

38. U. S. Naval Historical Center, *Dictionary of American Naval Fighting Ships,* vol. II, 531-32; Perry, *Infernal Machines,* pp. 97-108.

39. Bruce, *Lincoln and the Tools of War,* pp. 176-77; Brodie, *Sea Power in the Machine Age,* p. 272.

40. Still, *Iron Afloat,* pp. 213-14.

41. For American importation of scientific and technical ideas in the 19th century, see Kendall A. Birr's remarks in *Science and Society in the United States,* eds. David D. Van Tassel and Michael G. Hall (Homewood: The Dorsey Press, 1966), p. 77. Nathan Reingold, "Science in the Civil War: The Permanent Commission of the Navy Department," *Isis* (September 1958), pp. 3-17, suggests that most Civil War inventions had an empirical basis.

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A Grounding in the Bahamas in 1851

FRANK B. EVANS III

DURING the nineteenth century countless sailing vessels plied regularly between east coast ports of the United States and Havana. On the southern passage, to avoid the adverse current of the Gulf Stream in the Straits of Florida, they followed a standard route through the Bahamas. Running down in the open ocean to the southernmost tip of Great Abaco Island, marked by a lighthouse, their captains then turned west into the deep Northwest Providence Channel to reach the northern edge of the Great Bahama Bank, where they turned southwest toward Cuba. Crossing the Bank entailed precarious sailing, for there were then no navigational aids over some ninety miles of water barely deep enough at best even for vessels of modest draft. The approach to the northeastern corner of the Bank, moreover, is blocked by the Berry Islands, a chain of cays and reefs extending in a semi-circle southward from Great Stirrup Cay. Only by passing north and then west of Great Stirrup Cay could a ship safely reach the Bank. There was no lighthouse at this critical turning point until 1863.

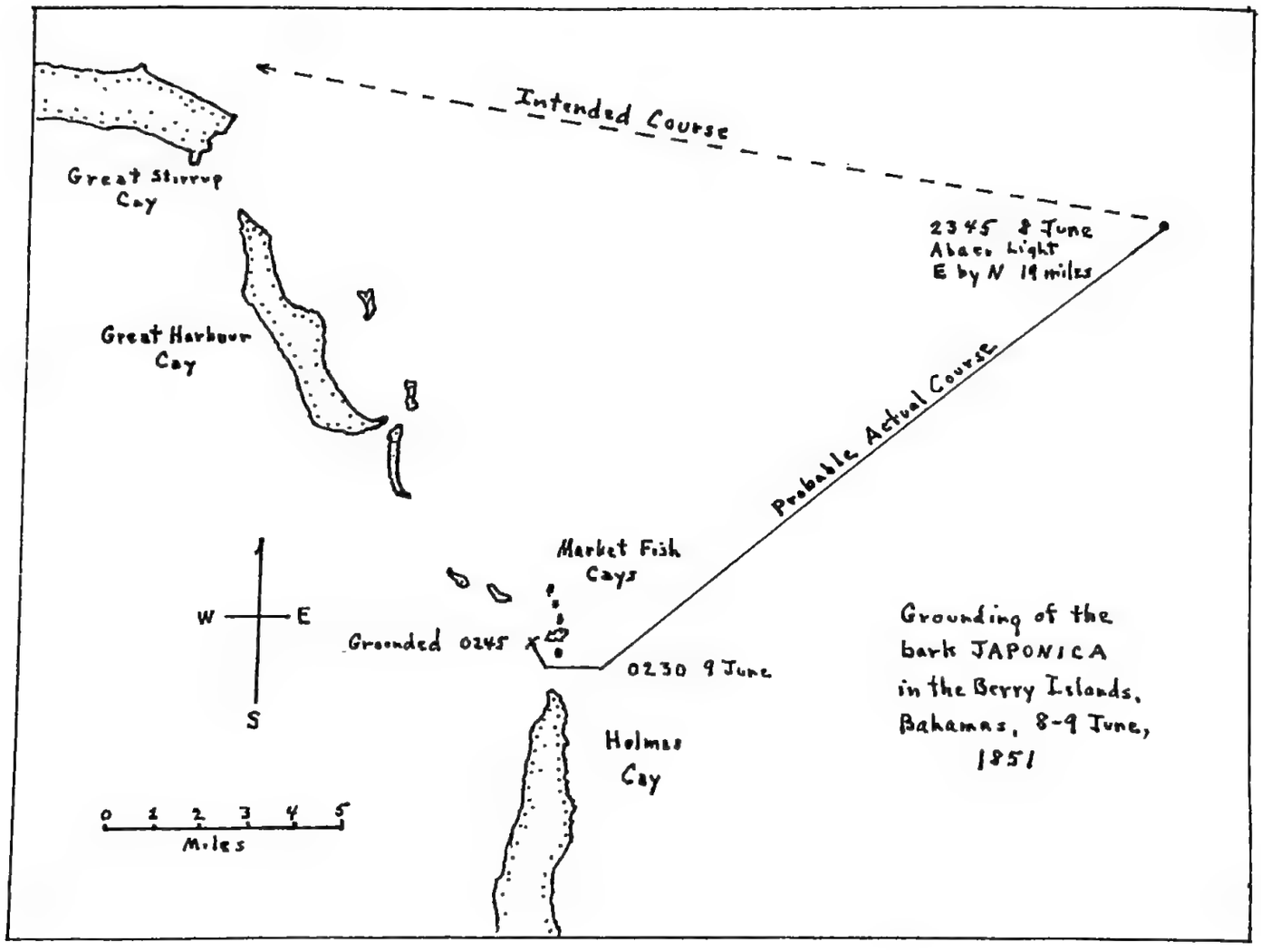
The bark *Japonica* of Philadelphia, commanded by Captain John Gallagher, made this voyage to Havana probably many times around the middle of the century. Three of her voyages in 1851 are recorded in a log kept by John's son William B. Gallagher, my great grandfather. William Gallagher was then just twenty. He had no doubt sailed with his father on earlier voyages. On the three which he recorded he presumably served as first mate and was preparing himself for command, which he attained four years later as master of the bark *Warren Fisher*. An experience during the second recorded voyage of *Japonica* must have impressed on him the unpredictable and sometimes inexplicable pitfalls in navigation which face the master of any vessel.

Two weeks after returning from an uneventful voyage to Havana, *Japonica* cleared Delaware Bay on 27 May 1851 bound again for the Cuban port. At noon on Sunday 8 June she was three miles northeast of the lighthouse at the southern tip of Great Abaco Island. She spent the afternoon beating around the point, known as "The Hole in the Wall," against a fresh breeze from the west-southwest. It was calm that evening between seven and eight o'clock, the weather "sultry." Probably during this calm William Gallagher made a pencil sketch of the broken ledge of "The Hole in the Wall" and the lighthouse, which appears at the bottom of the page of his log for the preceding day. The sketch indicates that *Japonica* was then well around the point, approximately four miles south-southeast of the lighthouse. She had safely made her first landfall and was ready to run the forty miles or so across the Northwest Providence Channel to her next landfall at Great Stirrup Cay.

At eight o'clock that Sunday evening "a light Breeze Sprung up from the South." The light on Great Abaco then bore north, distant six miles. *Japonica* steered west on a port reach, making three knots. By ten o'clock there was a "Strong Breeze" and her speed increased until at midnight her log records seven knots. Fifteen minutes before midnight she had lost sight of the light on Abaco, bearing "E by N Dist. 19 miles or thereabout." Nineteen miles is the extreme limit of visibility of that light. *Japonica* was approximately halfway to Great Stirrup Cay, but about three or four miles south of the direct rhumb line course. At her speed of seven knots she should have reached Great Stirrup Cay in about three hours, or at approximately a quarter to three Monday morning.

It is not clear who was on watch that morning, but a shift in the log from the singular to the plural first-person pronoun suggests that William Gallagher had the conn until his father was called on deck in the ensuing emergency. What happened is best stated in the actual words of the log:

> All hands composing the watch on Deck keeping a good lookout ahead. At 2:30 A.M. made the land ahead judged it to be great Stirrups key Kept off N.W. to clear it, a short time after made land on the Lee Bow which we knew to be tish [*sic*] Key and as our chart shows that there is 12 ft. of



water in the Channel and the vessel drawing but 11 ft. 6 in and it being tip high water we kept off N.N.W. in order to run through keeping the lead going, at 15 min. before 3 a.m. run aground she went on so easy that no person on board was aware until they noticed that she did not move through the water, and the warning which the lead gave.

All sail was taken in, boats hoisted out, and the channel sounded. No more than seven to ten feet was found ahead or abreast of the ship. The bottom was soft white marl. A kedge anchor was set astern to haul off. During the morning several "wreckers" gathered around *Japonica,* but she refused their help.

At half past one Monday afternoon, when the tide was rising, all sails on the mainmast were set and laid aback. Cargo was shifted forward to raise the stern, the ship's head was successfully hove around to the southeast, and all sail was set in an effort to move her. But as the kedge hawser parted several times and high water was near, Captain Gallagher was finally compelled to hire "a gang of men" and their kedge anchor from the "wreckers." At half past four *Japonica* came off and stood to sea. Sixty dollars went to "William Bain and his men" for their aid. William Gallagher expressed his opinion of the "wreckers" with considerable acrimony:

Governor Ellis of Stirrup Key came off to us, also Berttie Captain of a wrecker, and Capt Gomez of the wrecking Schooner Mosc, these three men are the greatest rascals about there, and I believe that they would commit any act if they were not subject to the English laws, especially the latter named as he shows that in his countenance. Governor Ellis and Johnson tried all in their power to get us ashore on

the lower point of tish Key. In fact all the inhabitants are of a piratical nature, at one time today I counted upwards of 50 Negros on Board which race are the chief inhabitants of the Islands, what few whites there are, appear to me to be subservient to the Blacks.

Scavengers anxious to prey on ships in distress were not uncommon in the Bahamas (and elsewhere) during the nineteenth century.

Precisely where did *Japonica* suffer her mishap? Clearly William Gallagher did not know the correct name of the islet he twice calls "tish Key," nor did he bother to ascertain it while he was preoccupied in the more urgent business of getting the ship off. But someone on board did know the name: "Land on the Lee Bow which we knew to be tish Key." Patently "tish Key" is William Gallagher's misunderstanding of the actual name called out by his father or a seaman at the moment of emergency. Several small Cays in the central Berry Islands are called the Market Fish Cays. The largest of this group lies half a mile north of Holmes Cay, which apparently was the land sighted at half past two in the morning and "Judged . . . to be great Stirrups key." This mistaken identification would have been natural, for at *Japonica*'s recorded speed of seven knots at midnight she should have reached Great Stirrup Cay from her position fifteen minutes before midnight at almost precisely that time. When she "Kept off N.W. to clear" the upper end of Holmes Cay, she would have found the southernmost Market Fish Cay on her lee or starboard bow almost immediately ("a short time after"). It was then, we may suppose, that someone sang out "Fish Cay!" There is a narrow channel inside the Market Fish Cays which leads back out into deep ocean water. When *Japonica* bore off further to the north-northwest she was headed through this channel, but she was evidently not in the center and ran aground within fifteen minutes. The actions taken immediately before the grounding are entirely consistent with the supposition that the Market Fish Cays were indeed the scene. With a bit of luck, *Japonica* might have gotten through safely.

If this supposition is correct, *Japonica* was some twelve or thirteen miles southeast of where she had expected to be. As the accompanying sketch indicates, she had made good a course about 45° to the left, or south, of her intended course. A navigational mistake of this magnitude could not have resulted from the accumulation of normal small errors during a run of less than three hours. Around midnight, apparently, she must have changed course drastically.

Believers in the theory of the "Bermuda triangle" will no doubt have a ready explanation. Indeed, the incident is precisely the sort that could invite some occult speculation. *Japonica*'s log gives specific and rather full information about what happened, but there is no inkling of why. If John and William Gallagher ever discovered what error led *Japonica* to her ignominious but harmless grounding, they did not confide the secret to posterity. If there was some mistake that did not redound to their credit, they were doubtless not the first or last seamen to keep silence. Being practical men, they were more concerned to set *Japonica* afloat and sail her on to Havana than to speculate about the cause of an irretrievable mishap. But it is not difficult to suggest several entirely mundane causes any one of which might have resulted in the grounding: a misunderstanding about the course when the watch was changed at midnight, gross inattention on the part of the helmsman, or a serious deflection of the compass due to the presence of some iron object near it, nothing more mysterious perhaps than a jack-knife in the helmsman's pocket. The weather was "sultry" and visibility probably minimal. If there had been a light on Great Stirrup Cay in 1851, it might have become visible shortly after midnight and the navigational error could have been detected. Years later William Gallagher pinned to the flyleaf of his journal a "Notice to Mariners" announcing that a light "recently erected" on Great Stirrup Cay would be in operation on and after 1 May 1863. He must have recalled ruefully *Japonica*'s experience twelve years earlier.

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REVIEW ARTICLE

The Maritime Mediterranean, 500-1571 A.D.

A BOOK which has just appeared by John H. Pryor entitled *Geography, Technology and War. Studies in the Maritime History of the Mediterranean, 649-1571* (Cambridge 1988) makes important contributions to our knowledge of the naval and maritime world of the Mediterranean during the late Middle Ages and early modern times. The issues raised by this study deserve a careful examination by those interested in the history of the sea.

Professor Pryor who has written extensively about business contracts, commerce and navigation in the Middle Sea during the Crusading period and especially the thirteenth century has managed in his first chapters to present for us a unique study of the winds and currents of the Mediterranean. There he shows how for more than a thousand years these determined, in general, how commercial vessels and warships sailed its waters. He has also made use of the latest research concerning merchant ships and warships to show how they changed technologically during these centuries and how such changes influenced both commerce and conflicts of the sea.[1] The result is a book which promises to be a classic for years to come, and which comes to the conclusion that history of the Mediterranean during these years in no small measure went to those who controlled its islands; the Balearics, Sardinia, Corsica, Sicily, Crete, Rhodes and Cyprus. This is so, the author claims, since both geography and the nature of sailing vessels during this period made control of these islands vital to those who wished to travel along Mediterranean waters.

Then Pryor examines conflicts at sea and commercial rivalry afloat between the Islamic World and Christendom, east and west, from the ninth century to the Battle of Lepanto in 1571 in the light of what we may term his "island thesis." He does so in a number of chapters which deal one after another with; the ninth and tenth centuries A.D., the Crusading years of the late eleventh, twelfth and thirteenth centuries, and the age of Western European maritime domination of these waters during the fourteenth and fifteenth centuries with special emphasis on corsair activities. Then he ends with chapters which describe the part played by Ottoman Turkish fleets and Barbary pirates during late medieval and early modern times up to 1571 A.D.[2]

It is in this second section of his book in which his "island thesis" is used to explain what happened in the maritime history of this part of the world that serious questions need to be raised by historians of the sea. And it is to these questions that we are now directing our attention. In doing so we do not wish to question the importance of what Pryor has presented in his volume, but only whether or not he has given us the *full* story.

Before we do so we need to pay special attention to the basic over-all picture he has presented of the Mediterranean during these years. He sets up this picture in his preface where he says he is concerned with "the relations between Islam and Christendom across the Mediterranean over an extended period of time" and "that this is his reason for writing this book." Thus he attempts to establish for us and for himself the concept of two distinct and/or hostile maritime entities, the Islamic World on one side and something he calls "Christendom" on the other.

Now while no one can deny that the Islamic world had a certain over-all cultural and religious unity during the period covered by this volume,[3] one must emphasize that that did not extend to a unity as regards maritime conflict. Quite the contrary. Thus in the eighth century the Ommayads of Spain were so hostile to the Abbasids in the Eastern Mediterranean World

1. J. H. Pryor, *Geography, Technology and War*, pp. 1-101 and 197-99.

2. *Ibid.*, pp. 102-196.

3. For an overview of Islamic civilization *circa* 1000 AD, about the time Pryor begins his narrative, see A. R. Lewis, *Nomads and Crusaders* (Indiana Univ. Press, 1988), pp. 27-47.

that they were allied with the Christian Byzantine Empire, while Charlemagne in the Latin West was such an enemy of both the Ommayads and Byzantium that he was an ally of the Caliphs of Baghdad.[4] Again in the tenth century when Islamic ships controlled much of the Middle Sea, Fatimid sea-power for decades was directed against both the Ommayad Caliphs of Cordova in the West and the Ikhshids who controlled Syria and Egypt. And indeed it was in no small measure the maritime assaults of the Fatimids on the Ikhshids, which were ultimately successful, which made it possible for Byzantine flotillas to recover Crete and Cyprus from the Moslems who held these islands.[5]

Later on in the fifteenth century there is no evidence of any maritime or naval collaboration between the small, efficient Mamluk fleet based on Egypt and the rising naval power of the Osmanlis even after the latter took Constantinople in 1453 and became a maritime force in the Aegean.[6] And in the late sixteenth century Ottoman Sultans were so hostile to the Islamic rulers of Morocco that collaboration between corsairs operating from the North African ports of each realm proved to be all but impossible.[7]

As for "Christendom"—whatever that means, we need to recognize that it is *very* seldom between the eighth and thirteenth centuries that we find any collaboration or alliance at all between the maritime world of the Latin West and that of the Byzantine Empire. Only briefly, during the last years of the reign of Louis the Pious, or during certain Crusades do we find hostilities between the two suspended.[8] And even then Byzantine Comneni rulers, like their Macedonian Imperial predecessors, had to oppose periodically the maritime initiatives of Western Norman rulers of the Two Scilies or of Italian merchants and sailors from Genoa, Pisa or Venice.[9]

After Byzantium ceased to be a maritime power as a result of the Fourth Crusade again there was no Latin "Christian" unity on the sea either, despite Papal efforts to establish it. Economic rivalry caused Venice and Genoa to fight a series of bitter naval wars in the Eastern and Central Mediterranean from the thirteenth century on, while the latter battled Pisa in the West as well.[10] And, as is well known, during the thirteenth and fourteenth and following centuries Catalan fleets periodically faced hostile Genoese and French flotillas in the Western Mediterranean.[11] We also know that in the course of the sixteenth century it was the enmity between the Hapsburgs and the Valois monarchs of France which gave Moslem corsairs from North Africa an opportunity to do great damage on the sea to Christian shipping until the Battle of Lepanto ended this menace.[12] In short one cannot talk of the Islamic world or Christendom as if they were maritime *units* in conflict with each other during these centuries. To do so, as Pryor believes possible, is to falsify the maritime history of the Mediterranean over the long period of time covered by this book.

Secondly, we need to note that although the author has titled his volume *Studies in the Maritime History of the Mediterranean, 649-1571* he actually does not begin his narrative until the late ninth century A.D. This is unfortunate because he not only misses the importance of that naval-maritime Mediterranean empire established by Justinian in the first half of the sixth century A.D.,[13] he does not deal with the Ommayad Arab assault upon this empire from 649 to the mid-

4. A. R. Lewis and Timothy Runyan *European Naval and Maritime History, 300-1500* (Indiana Univ. Press 1985), pp. 42-44 and A. R. Lewis "Mediterranean Maritime Commerce, AD 300-1100. Shipping and Trade" in *The Sea and Medieval Civilizations* (London 1979), pp. 11-13 and *Naval Power and Trade in the Mediterranean, AD 500-1100* (Princeton 1951), pp. 88-97.

5. Lewis and Runyan *op. cit.* pp. 45-46 and V. Lev "The Fatimid Navy, Byzantium and the Mediterranean Seas, 909-1036" in *Byzantion* 54 (1984), pp. 220-52.

6. Pryor *op. cit.* pp. 178 ff and Lewis "Maritime Skills in the Indian Ocean" in *The Sea and Medieval Civilizations* pp. 259-61 and "Les Marchands dans l'Ocean Indien, 1200-1500 AD" in *Ibid.*, pp. 464. See also D. Aydlon "The Mamluks and Naval Power: A Phase in the Struggle Between Islam and Christian Europe" in *Proceedings of the Israeli Academy I* (1965).

7. A. C. Hess *The Forgotten Frontier: A History of the Sixteenth Century Ibero-African Frontier* (Chicago 1978) esp. pp. 70 ff.

8. These two Christendoms, Eastern and Western are compared in detail in Lewis *Nomads and Crusaders* pp. 46-86.

9. On Comneni difficulties with the Latin West see A. R. Lewis "The Economic and Social Development of the Balkan Peninsula during Comneni Times, A.D. 1081-1185" in *The Sea and Medieval Civilizations*, pp. 407-12, Helène Ahrweiler *Byzance et la Mer* (Paris 1966), pp. 175-225 and Charles Brand *Byzantium Confronts the West* (1180-1203) (Harvard 1967), pp. 8-91.

10. Lewis and Runyan *op. cit.*, pp. 71-2. And for an example of this rivalry see John Dotson "Naval Strategy in the First Genoese-Venetian War, 1257-1270" in *The American Neptune* XLVI (1986), pp. 84-90.

11. Lewis *Nomads and Crusaders*, pp. 172-74.

12. P. Coles *The Ottoman Impact on Europe* (London 1968). P. 18 ff.

13. Justinian's maritime empire is examined in some detail in Lewis *Naval Power and Trade*, pp. 7-65 and Lewis and Runyan *op. cit.*, pp. 16-22.

eighth century including two great Arab attacks upon Constantinople in 672-78 and 717-18[14] and the period from 747-830 A.D. when Byzantium dominated most of the Eastern and Central Mediterranean through control of those islands which he deems so vital—Sardina, Sicily, Crete, Rhodes and Cyprus.[15] Had he begun his story a little earlier, then, his study might be more persuasive.

The chief failure or limitation of this otherwise excellent book, however, is a geographical one—that is to say the author's failure to grasp the importance not only of his islands—but also of the three great entrances to the Mediterranean from a maritime point of view. These entrances were and are, the Hellespont-Bosphorus complex between the Black Sea and the Aegean-Mediterranean, the Straits of Gibraltar complex leading from the Atlantic to the Mediterranean, and the Suez-Egyptian area that linked the Red Sea and Indian Ocean to the Middle Sea—even before the construction of the Suez Canal.

Let us examine these three entrances historically over the period covered by this volume and even a little earlier and begin with the Hellespont-Bosphorus complex. Though this entrance had some importance in classical times and especially for Athens in the fifth century B.C.,[16] it really became vital only after Constantine moved his capital to Byzantium in 323 A.D. By the late fifth century A.D. this had resulted in the rise of the great city of Constantinople on the Golden Horn—a city so important that from now on we have to think of the Black Sea as being part of what should be called the Mediterranean-Black Sea complex—and an essential center of what was to become the powerful Byzantine Empire.[17]

As is well known, a Sassanian-Avar attempt to take this complex failed in 626[18] and so too did two more important Arab maritime assaults in 672-78 and 717-18.[19] It was these failures which allowed the Byzantine Empire to survive and venture out into the Central and Eastern Mediterranean successfully in the late eighth century[20] and again in the late tenth and early eleventh.[21] And control of this complex still kept Byzantium strong in the Eastern Mediterranean under the Comneni until the time of the Fourth Crusade.[22]

It was this Fourth Crusade of 1204 which changed this state of affairs. It ended, for all time, the possibility of a viable Byzantium—even after Constantine VIII had recaptured Constantinople proper in 1263. From now on down to 1453 control of this complex by Italian ships allowed Latin merchants access to the lower Danube, South Russia, the silk routes across Asia to China, and the Middle East via the Black Sea port of Trebizond.[23]

Once Mehmet the Conqueror had captured Constantinople and built flotillas in what had been Byzantine dockyards it was this complex which was the nerve center of the Osmanli's naval and maritime power to absorb Egypt and Syria, take Rhodes and Cyprus and threaten Western Europe in the western waters of the Mediterranean.[24]

14. *Ibid.*, pp. 24-29 and Lewis *Mediterranean Maritime Commerce*, pp. 11-13.

15. Lewis *Naval Power and Trade*, pp. 78-85.

16. Perhaps the Homeric Greek attack on Troy was a first attempt to control this complex. But more important was Athens' effort to control it to insure grain supplies reaching her from the Black Sea. As is well known, Athens failed in this objective when, towards the end of the Peloponnesian war, the Spartan Admiral Lysander destroyed the Athenian fleet at Aegospotami.

17. Rome's increased concern for this complex began after she annexed the client kingdom of Thrace in the first century A.D. and after Trojan, a little later, conquered and annexed Dacia. For the later importance of the area after the fourth century A.D. see A. R. Lewis "The Rise of Constantinople and its Significance" in *Religion, Society and Culture in the Early Middle Ages* (Kalamazoo 1987), pp. 1-6. For the geographical basis of this Eastern Roman Empire which centered in Constantinople see Lewis *Nomads and Crusaders*, pp. 49-53.

18. Lewis *Mediterranean Maritime Commerce*, pp. 2-5 and "Byzantine and Moslem Shipping in the Mediterranean, 600-1250" in *The American Neptune* XLVI (1987), pp. 157-58.

19. Lewis and Runyan *op. cit.*, pp. 42-43.

20. If Justinian's reconquest of most of the Mediterranean West, including the area of the Straits of Gibraltar, represents the first expansion out of this Aegean-Black Sea complex, that of the Isaurians between 747 and 820 was the second. See Lewis and Runyan *op. cit.*, pp. 43-44 and Lewis *Byzantine and Moslem Shipping*, pp. 158-59.

21. See Pryor *op. cit.*, pp. 106-111, Lewis *Naval Power and Trade*, pp. 132-82 and Ahrweiler *op. cit.*, pp. 167-71 for this third Byzantine move out into the Central and Eastern Mediterranean area.

22. The fourth and final Byzantine movement in force by sea into the Mediterranean from this complex at the time of Manuel Comnenus is described in Lewis *Nomads and Crusaders*, pp. 123-27.

23. Probably we should view the Ottoman Naval advance into the Mediterranean from Egypt to Algeria as the fifth and last such effort since the complex became a viable center in the late Roman imperial period. On this see A. C. Hess "The Evolution of the Ottoman seaborne empire in the age of Oceanic Discoveries" in *American Historical Review* 75 (1970), pp. 1892-1919 and H. Inalcik *The Ottoman Empire: The Classical Age* (London 1973), pp. 131-280.

24. See J. Gage "Gades, l'Inde et les navigations Atlantiques dans l'Antiquité' in *Revue Historique*, CCV 1951. It is interesting that many of these Atlantic voyages only took place *after* Rome annexed the client Kingdom of Mauritania in the first century A.D.

Turning from the Northeast to the West let us consider the second important entrance to the Mediterranean, that is to say Gibraltar and land on both sides of this strait. Though this passage between Africa and Spain to the Atlantic had been in use in Phoenician and early Roman Imperial times, as the early history of Cadiz makes clear,[25] it was Justinian's reconquest of Andalusia and the Ceuta-Volubis area of Morocco in the mid-sixth century which begins our story.[26] Following this reconquest we have evidence of a trickle of trade out into the Atlantic as far north as Ireland, the British Isles and Western Gaul and even some traffic by a few northern European mariners into the Mediterranean itself.[27]

The Moslem conquest of Spain in 711 seems to have ended all of this traffic to the Northern Seas of Europe. But it did result in some important *local* seapower and maritime activity from Lisbon to Algeçiras and along Atlantic Moroccan shores—both of which were closely connected to a Moslem dominated western Mediterranean. There is even some evidence that by the twelfth and thirteenth centuries a few Moslem sailors from these shores were venturing out into the South Atlantic as far as the Canaries and the Guinea coast of Africa.[28] And it was perhaps the importance of this maritime region on both sides of the Straits of Gibraltar which caused Viking adventurers to raid these shores in the mid-ninth and ten centuries—attacks that were on the whole not very successful since the Ommayad rulers of Spain maintained effective fleets to protect their Atlantic coasts.[29]

Soon after 1031 when the Ommayad Caliphate of Iberia had disintegrated and with it its fleets, the situation began to change in two ways. Gradually the Christian *Reconquista* monarchs moved south, often with northern European naval help, to recapture ports like Lisbon and Alcácer do Sal in Portugal. And periodically, when no strong Islamic powers dominated Spain and Morocco, it was possible to send Crusader fleets from northern Europe past Gibraltar all the way to the coasts of Syria and Palestine. The most famous examples of this were the Scandinavian royal flotillas which helped capture Syrian ports from the Fatimids during the last years of the First Crusade, and Richard the Lionhearted's great fleet which helped defeat Saladin and retake coastal Palestine during the Third Crusade.[30] Finally by the middle of the thirteenth century Christian Spanish rulers of Portugal and Castile opened the Straits to European Atlantic mariners by seizing from the Moors southern Portugal[31] and Andalusia with its great port of Seville,[32] while on the other Mediterranean side Aragonese fleets and armies took over the Balearics and Valencia and helped the Castilians occupy Murcia. All of this was done with the assistance of Genoese fleets whose merchants now had a strong foothold in Atlantic ports like Seville and Lisbon.[33]

Once the Straits of Gibraltar were in Latin Christian hands—and they remained so except for a brief Moorish interlude about 1340—this had a number of consequences. In the first place gradually Latin Westerners increased their control of this vital entrance to the Middle Sea. This began when Castile added Algeçiras to its realm in the late thirteenth century.[34] It continued when the Portuguese seized Ceuta in 1415 and thus opened the Mediterranean to their ships and

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Soon thereafter this resulted in trade as far out as the Canaries. A. M. Torres *Historia general de las Islas Canarias I* (Tenerife 1975), pp. 123-37.

25. On the importance of this reconquest of Southern Spain and the Moroccan Ceunta area by Justinian see Lewis *Mediterranean Commerce*, pp. 8-10 and Lewis and Runyan *op. cit.*, pp. 20-27.

26. Evidence for this commerce has been assembled in A. R. Lewis "Le commerce et la navigation sur les côtes Atlantique de la Gaule du V° au VIII° siècles" in *Le Moyen Age* LIX (Paris 1953), pp. 265-98 and in Lewis "Byzantine Light-Weight Solidi and Trade to the North Sea and Baltic "in *The Sea and Medieval Civilizations*, pp. 145-51.

27. See Lewis and Runyan *op. cit.*, p. 46 and E. Levi-Provencal *L'Espagne Musulmane and X° siècle* (Paris 1932). For Moslem trade out into the Atlantic before 1250 A.D. see F. Fernandez-Armesto *Before Columbus* (Philadelphia 1987), pp. 152-53 and *Historia general de las Islas Canarias I*, pp. 142-153.

28. Lewis *Nomads and Crusaders*, pp. 40-41.

29. Lewis "Northern European Seapower and the Straits of Gibraltar, 1031-1350 "in *The Sea and Medieval Civilizations*, pp. 140-151. On Richard's great fleet which passed through these straits see Archer *The Crusade of Richard I* (London 1912), pp. 1-180.

30. It is interesting that both the Almoravids and Almohads who controlled territory on both sides of the straits of Gibraltar most of the time from 1090-1250 A.D. had twin capitals in Seville and Marrakesh which faced the *Atlantic* and not the Mediterranean. On these realms see R. LeTourneau *The Almohad Movement in North Africa in the Twelfth and Thirteenth Centures*. (Princeton 1969).

31. On Seville's occupation by the Castilians and others after 1252 see F. Perez-Embiid "Navigation et commerce dans le port de Seville au bas moyen-âge" in *Le Moyen Age* LXXV (1969) and F. Fernandez-Armeste *Before Columbus*, pp. 51-55 and 141-48.

32. Lewis *Northern European Seapower and the Straits of Gibraltar*, pp. 152-53 and Fernandez-Armesto *op. cit.*, pp. 70-95.

33. Lewis *op. cit.*, p. 154.

34. For Ceunta's conquest see P. E. Russell *Prince Henry the Navigator* (London 1960) pp. 1-40.

those of their northern Eurpopean allies.[35] And the victory became complete when Granada fell to Ferdinand and Isabella in 1492,[36] and Portuguese monarchs seized much of Atlantic coastal Morocco from Moorish rulers.[37]

More important, however, were the results of these changes for Northern Atlantic Europe on the one hand and Mediterranean Latin Europe on the other. Now as Mediterranean and Atlantic became *one* from a maritime point of view, real technological exchanges took place between these two maritime areas. The Latin Mediterranean adopted the stern rudder, the compass and the cog itself from Northern Europe in the thirteenth century.[38] And by the mid-fourteenth it had begun to make extensive use of the full-rigged ship or *carrack* which, while essentially Northern European in design, seems to have been carvel built, as was the case with Mediterranean craft in general.[39]

As this was happening in the Mediterranean, the Venetians and Florentines and at times the Genoese and Majorcans, as well, developed the huge rowing galleys with *portolan* charts which could not only make their way out of the Mediterranean through the Straits of Gibraltar against adverse winds and current, but could carry valuable cargoes in great Flanders' fleets to Southampton and Bruges.[40] By the late fourteenth century or even earlier the Atlantic world from its Africa off-shore islands to distant ports of the Northern Seas had become linked to the Mediterranean,[41] just as was the case of the Black Sea from the time of the rise of Constantinople in the later Roman Empire.

The third great entrance to the Mediterranean, the Egyptian-Suez complex presents a more complicated problem. At certain times during the eighteenth dynasty of Pharonic Egypt, in Ptolemaic times, and during both the early Roman Imperial period[42] and the age of Justinian[43] this link was of vital importance. At times a canal from a branch of the Nile to the Gulf of Suez was even maintained. At other times it was less important, as was the case during the decades between 718 and 830 when Byzantine fleets controlled much of the Eastern Mediterranean.[44] Perhaps its most important era was when the Fatimids controlled Egypt for two centuries from 971 to the 1170s and when Geniza documentation in Cairo shows how merchant trade reached Egypt from al-Andalus on one side and, via the Red Sea, from India on the other.[45]

What seems to have changed all this was the establishment of the Latin Crusader Kingdom of Jerusalem about 1100 and the destruction of the Fatimid navy by the Venetians in 1123.[46] Not even Saladin's union of

35. The best recent work on the conquest of Granada is M. A. Ladero Quesada *Castilla y la conquista del reino de Granada* (Valladolid 1967).

36. Hess *The Forgotten Frontier*, pp. 102ff.

37. Pryor *op. cit.* pp. 39-44.

38. *Ibid.* and Lewis and Runyan *European Naval and Maritime History*, pp. 158-160.

39. On these routes leading to Southampton and Bruges see R. Doeherd (ed.), *Les relations commerciales entre genes, la Belgique et l'outremont* 3 vols. (Brussels 1969) and M. E. Mallet *The Florentine Galleys in the Fifteenth Century* (Oxford 1967).

40. Fernandez-Armesto *op. cit.*, pp. 151-252.

41. For the late Pharonic period when Thutmose III controlled Syria and Hatashepsut sent ships down the Red Sea to Punt see L. Casson *Ships and Seamanship in the Ancient World* (Princeton 1971), pp. 8-130. For the Ptolomaic period see Casson "Rome's Maritime Trade with the Far East" in *The American Neptune* XLVIII (1988) p. 151. During the early empire after Rome had taken over Herod's realm in Palestine, annexed the client Nabòtean kingdom and moved in force into the Hejaz under Hadrian, she controlled *both* sides of this link between Mediterranean and Red Sea. This caused a boom in trade with Indian Ocean areas. Casson *op. cit.*, pp. 149-53.

42. Justinian, who was always interested in foreign trade, expanded Rome's interests on the Red Sea side of this link by using Abyssinian surrogates who took over the Yemen and in 570 A.D., the year Mohammed was born, almost captured Mecca. For the results of all this see A. F. Hourani *Arab Seafaring in the Indian Ocean in Ancient and Medieval Times*. (Princeton 1951) pp. 36-50 and E. Windstedt *The Christian Topography of Cosmas Indicopleustes* (Cambridge 1909). For its significance see Lewis *Mediterranean Maritime Commerce* pp. 9-10.

43. On how this route declined in importance during these years see Lewis *Naval Power and Trade*, pp. 70-89.

44. This period of trade expansion, when the Fatamids controlled both Egypt and Syria on one side and the Hejaz and Yemen on the other is described in detail in Lewis *Nomads and Crusaders*, pp. 35-43 and 104-05. for the prosperous conditions in Egypt see S. D. Goitein *A Mediterranean Society* Vols. 1-5 (Berkeley 1967-88) esp. Vol. I.

45. For a view of the Fatimid failure to maintain control over the Mediterranean near Egypt see William Hamblin "The Fatamid Navy during the early Crusades, 1099-1124" in *The American Neptune XLVI* (1986), pp. 77-83.

46. Until Askalon (Modern Gaza) fell to the Crusaders in 1153 the Fatamids, who still controlled the Red Sea, were not too badly affected. All this changed when the Kings of Jerusalem invaded Egypt during the reigns of Baldwin III and Amalric I. See "The Latin States under Baldwin III and Amalric I, 1143-1174" in M. B. Baldwin *A History of the Crusades* I (Philadelphia 1955), pp. 528-61. Though Saladin then took over Egypt, captured most of Palestine, controlled the Hejaz and the Red Sea and built a new Mediterranean fleet, he ultimately failed to hold the coast of Palestine which was reconquered by the Third Crusade. On this see Andrew Ehrenkreutz "The Place of Saladin in the Naval History of the Mediterranean Sea in the Middle Ages" in *Journal of the American Oriental Society*, 75 (1955).

Syria and Egypt, and his construction of a new fleet could change this state of affairs.[47] As already noted, when Richard the Lionhearted destroyed Saladin's navy and regained coastal Palestine for the Latin world, this had economic results for the Red Sea-Mediterranean link that passed through Egypt.[48] The Ayyubid heirs of Saladin were unable to keep Crusaders in the Fifth and Sixth crusades from taking Damietta, and even their Mamluk successors, as Pryor has noted, essentially abandoned the sea along Egyptian and Syrian coasts from which they had expelled the Crusaders. And as late as 1365 Alexandria could be taken by a Crusading amphibious attack, and Mamluk domains, like those of their Ayyubid predecessors, failed at first to maintain the gold currency and prosperity of their Fatimid predecessors. Only in the late fourteenth century, after the Mongol Empire had completely disappeared, did sufficient wares from India and the Orient reach Egypt via the Red Sea to ensure some modest prosperity, a sound gold coinage and a small effective Mediterranean naval force.[49] And it was not until Egypt became Ottoman when it was absorbed by Selim the Grim in 1517 that real prosperity returned and the link between Middle Sea and Indian Ocean again became a vital one.[50]

What all this shows is that only when both Syrian approaches and Egypt proper were in the same hands was this land between the Mediterranean and Red Sea a bustling maritime and trading area. And that prior to the Suez Canal, control of Syrian and Palestine coasts was as important as the islands of the Mediterranean proper to this area which led from the Mediterranean to India.

We can sum up as follows. One needs to add to an "island thesis" of Mediterranean maritime power an understanding of the importance of its three entrances—the Hellespont-Bosphorus complex to the Black Sea, the Straits of Gibraltar-Morocco-Iberian complex to the Atlantic and an Egyptian-Suez link between the Red Sea and the Indian Ocean. It was Latin western control of the first two in the thirteenth century and their ability to recognize the importance of the latter that ensured their control of the Middle Sea until Ottoman times. And by then, for all practical maritime purposes, the Atlantic and Mediterranean worlds had become one, including those technologies found in both areas. Thus Western Europeans were able to make Ottoman control of the two Eastern Mediterranean gateways and some islands like Rhodes and Cyprus relatively unimportant for the long pull. Mediterranean islands were important—it is true—as Pryor has made abundantly clear, but Mediterranean maritime entrances were even more vital in preparing Western European ships and mariners for their role as controllers of the wider world of the Seven Seas.

We have one final question to raise about the Pryor thesis, his dismissal of the importance of the rise of capitalism in Latin Europe during the Crusading period and later on. Let us examine this matter in some detail. It is true that in the tenth century Moslem maritime powers like the Ommayads and Fatimids and Byzantine Macedonian emperors had the resources to maintain large dockyards and maritime establishments and were able to build large warships and efficient merchant vessels of considerable size.[51] In the Byzantine world this continued to be true until the end of the Comneni in the 1180s.[52] And in the Moslem world it also seems probable that both the Almoravids and Almohads were able to do the same in arsenals like those at Seville—at least down to 1252.[53] At times a Saladin could construct a huge ship like that attacked and sunk by Richard the Lionhearted during the Third Crusade.[54] But certainly on the whole by the thirteenth century it was the capitalistic system of the Latin West

47. Lewis and Runyan *op. cit.*, pp. 75-76 and Ira Lapidus *Islamic Cities in the Later Middle Ages* (Cambridge 1967), pp. 30-187.

48. Lewis *Nomads and Crusaders*, pp. 142-46 and 172-189, as well as "Maritime Skills in the Indian Ocean, 1368-1500" in *The Sea and Medieval Civilizations*, pp. 238-61. See also Ayalon "The Mamluks and Naval Power" in *op. cit.*

49. Pryor *op. cit.*, pp. 191-92. For evidence of Ottoman naval crews manning naval vessels at the mouth of the Red Sea near Aden to protect pilgrims to Mecca and Red Sea commerce nearby late in the 16th century see R. Sergeant *The Portuguese off the South Arabian Coast* (Oxford 1963), pp. 140-71.

50. Lewis "Byzantine and Moslem Shipping in the Mediterranean" in *The American Neptune* XLVII, pp. 159-60.

51. Lewis and Runyan *op. cit.*, pp. 36-37.

52. Lewis *Northern European Seapower and the Straits of Gibraltar*, pp. 147-54.

53. Archer *The Crusade of Richard I*, pp. 77-78.

54. For large Genoese and Venetian sailing galleys used in *both* the Mediterranean and the Atlantic see J. Dotson "Merchant and Naval Influence in Galley Design at Venice and Genoa in the Fourteenth Century" in *New Aspects of Naval History: Selected papers presented at the fourth Naval history symposium* (Annapolis 1979), pp. 20-32. For other ships J. Heers "Types de Navires et specialization in des Trafics en Mediterranée à la fin du moyen age" in M. Mollat *Le Navire et l'economie maritime du XV° and XVIII° siècle* (Paris 1958), pp. 107-17. The advantages the Latin West gained from its capitalistic system are summarized in Lewis and Runyan *op. cit.*, pp. 56-58.

which made possible the construction of large and effective warships and merchant vessels in Catalan, Provencal and Italian dockyards—and especially the arsenal of Venice. It is no accident that all the *large* ships, Atlantic sailing galleys, cogs, *tauridas* and carracks in the Mediterranean were built by the Latin West from the thirteenth century on.[55] Even Ottoman galleys—though excellent—were smaller than those of their Venetian and Hapsburg opponents.[56] Thus Latin Christian advantages of a *technological* sort over those of their Islamic opposite numbers in the Mediterranean *included* the growing capitalism of a Western Europe commercial revolution which cannot be dismissed as some kind of ideology as Pryor attempts to do.

We can sum it all up then. While welcoming the volume of Pryor and saluting its importance, we need to *add* to it an understanding of the importance of starting his story at least with the world of the Mediterranean in Justinian's time, and recognize that terms lke Islamic World and "Christendom" are essentially abstractions that do not fit the reality of conflict and competition in the Mediterranean. We need even more to extend his geography to concern ourselves with the three major entrances to the Mediterranean proper. And finally we must remember that maritime technology always depended in no small measure on the resources a society could allot to it. And certainly by the thirteenth century Western Europeans had developed a capitalism which could build better ships and sail them more economically than their Byzantine and Moslem Mediterranean counterparts. And this was one indispensable reason for their success in the modern age of sail which followed.

ARCHIBALD R. LEWIS
Salem, Massachusetts

55. J. F. Guilmartin *Gunpowder and Galleys, changing technology and Mediterranean Warfare at sea in the sixteenth century* (Cambridge 1975), pp. 210-66.

56. How Western Europeans made use of all these advantages on the world scene after 1500 is made clear in A. R. Lewis "The Medieval Background of European and American Oceanic History" in *The American Neptune XLV* (1985), pp. 226-35.

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Book Reviews

ERIC J. GROVE, *Vanguard to Trident: British Naval Policy Since World War Two* (Annapolis, Maryland; U.S. Naval Institute Press, 1987), hardback, 487 pages, bibliography, appendices, index, illustrations, $34.95.

Vanguard to Trident is mostly about disagreements in Whitehall over how much money should be spent to support the Royal Navy in the years after V-J Day. It is in many respects an account of the conflicts between admirals, the Admiralty, the Ministery of Defense, the Treasury, and various officials and politicians over the size and configuration of the Royal Navy after World War Two up through the Falklands War. It is in large, a question of how much money should be spent for naval forces. The problem, central to this question, is that of reconciling economic reality with political and strategic requirements. This in turn is transmitted into how many and what type of ships and men are required by the Royal Navy to carry out British political and strategic commitments without forcing the British government into bankruptcy.

Britain, at the end of World War Two, had the second largest navy in the world, a wrecked economy, and world wide naval commitments. In the years after World War Two the British government, confronted with a general lack of money, had to decide how to meet the demands brought about by such events as the Cold War and the disbanding of the British Empire. With a weakening economic basis to support the Royal Navy combined with the increasing costs of modern weapons, plus endless commitments, the British government and the Royal Navy in the years after World War Two were forced to make some very hard decisions on such things as weapons systems and force levels.

This is the major theme of *Vanguard to Trident*. Eric J. Grove not only deals with the endless fights in Whitehall about money, but adds to his study by dealing also with operational matters, such as, the *Amethyst* and the Yangtse incident, the Korean War, Suez, Malaysia, the east of Suez policy, commitments to NATO, and the problems caused by the introduction of new weapons systems, such as the Polaris submarine. *Vanguard to Trident* ends by posing the question that, given Britain's present economic situation, the British government is now confronted with the choice of either adopting the trident submarine at the cost of not having a balanced fleet or foregoing trident and maintaining a credible navy. *Vanguard to Trident* is a complex book, well researched, but mostly owing to the subject matter, at times difficult to read, and is alive with photographs and ships' plans. All in all, Mr. Grove has done a great job and British naval policy since 1945 cannot be understood without reading *Vanguard to Trident*. It is a thoroughly recommendable book, as much for its contents as for the author's in-depth research and analysis.

DAVID SYRETT

Queens College, CUNY

THOMAS O. SELFRIDGE, JR., *What Finer Tradition: The Memoirs of Thomas O. Selfridge, Jr., Rear Admiral, U.S.N.* Maritime History Series, edited by William N. Still, Jr. (University of South Carolina: South Carolina Press, 1987). Cloth, 296 pages, $19.95.

We owe gratitude to the editor for reviving this admirable book. It is worth reprinting for its account of the Civil War and subsequent years as told by a tough, highly capable, "can do" sea dog. The matter-of-fact relation of life afloat and high service to America under intolerable conditions (in the eyes of today's spoiled Americans) is worth reading to bring us back to understanding the basics. Dr. Still's excellent introduction adds to the value of this interesting book.

It is worth having this work readily available if it helps readers to realize the critical importance of strength at sea that has shone like a rising tide in all the United States' history. It was decisive in keeping our nation united in the Civil War. It has been vital in all wars since, time after time forcing us to relearn the obvious truth that if we do not control the sea, we cannot win overseas—or prevent disaster on our shores.

Reading these memoirs also points up the speed with

which power at sea with its phenomenal new weapons becomes ever more potent. Thomas Selfridge plays a role in the early stages of some of these, for example—submarines. He commanded *Alligator,* an eight-oarsman-propelled submarine in experimental trials. These demonstrated her to be futile. Yet only half a century later—so swift were developments in engineering and other fields—that a handful of German submarines became the terror of the seas.

Now just a few decades later *Trident* submarines have grown in power and size incredibly. Submarines in World War II could dive to a maximum of a few hundred feet. They had to surface almost daily for air and to recharge batteries. *Tridents* today can safely plunge thousands of feet into the depths. Instead of torpedoes with a range in the thousands of feet, they carry awesome guided missles that reach into the heart of continents with destructive accuracy. They navigate in the depths with precision without ever seeing the heavens. They dive outside home port, cross the ocean, patrol for many weeks, recross the ocean, and finally surface again for the first time outside home port.

The mad pace of change sweeping through man's life in the waning twentieth century affects not only submarines, but all else in multi-faceted seapower—surface, air, amphibian, electronic, etc. We know not where this breathless change will take us. But we do know that strength on the oceans steadily plays an ever larger role in our destiny. If we fail to stay on the crest of change, we fail to survive free.

ERNEST M. ELLER

Annapolis, Maryland

ANDREW LAMBERT, *Warrior, The World's First Ironclad Then and Now* (Annapolis, Md.: Naval Institute Press, 1987). 8" × 10½", 192 pages, extensive illustrations, plans, bibliography and index. $19.95, hardcover.

In one of those strange quirks of history, French Emperor Louis Napoleon Bonaparte (nephew of the great Napoleon) decided to challenge the sea supremacy of Great Britain soon after Britain had been an ally of France in the Russian war of 1854-1865. It was not that Louis really disliked the British, but he sensed that the people of France were anti-British; hence, a challenge to England would help strengthen his regime.

What happened as a result of Louis' challenge was wholly unexpected by the Emperor: The British created *Warrior,* upsetting the applecart for the French Navy and all the other navies of the world.

The story of *Warrior,* how she was created, her impact on navies in general and the present status of the famed old ship is told in this complex book written by Dr. Andrew Lambert, British historian specializing in 19th Century naval affairs and editor of the periodical *Warship*.

The era Lambert writes about in *Warrior* was when wooden warships had run their course. The French had experimented with armor for wooden ships but the development of Henri Paixhan's explosive shell beginning in 1820 made it just a question of time before wooden warships would be doomed. The first protection for wooden ships using thin iron plating was a disaster.

The chief constructor for the French Navy, Stanislas Dupuy de Lome, developed armor plating 4½ inches thick. For the new fleet of Emperor Louis, de Lome started with *Gloire*. But lacking the skills of the British in iron ship construction, he built *Gloire* of wood and plated her with heavy armor. Meanwhile, Britain was preparing for the worst—maybe even an invasion try by France.

Britain's "secret weapon" in this time of crisis was Admiral Sir Baldwin Walker, Surveyor of the Navy. Walker was an able and imaginative administrator who had the vision to see what a modern warship should be.

In building *Warrior* as a response to the French challenge, Walker virtually doubled everything about *Gloire*:

Warrior was a sea-going iron fighting ship; *Gloire* was more of a coastal vessel with a wooden shell protected by iron.

Warrior was 420 feet long; *Gloire* was 255.

Warrior, with her 5267 ihp engines could develop 14.08 knots while *Gloire* with 2500 ihp could do 12.5 knots.

Warrior displaced 9137 tons to *Gloire*'s 5630 tons.

Gloire was obsolete the day of her commissioning.

With *Warrior,* the age-old concept of wooden Line-of-Battle Ships was dead. It has been said that *Warrior* could have sunk every wooden naval ship afloat. Lambert says that with *Warrior*'s superior speed, armor and long range guns "she could have destroyed any single wooden ship in short order." The impact of *Warrior* and successor ships of her type was compara-

ble to the effect on navies when Britain commissioned *Dreadnaught* in 1906.

Back in the 1850s, naval constructors and shipbuilders were learning fast about switching from wood to iron ships. Converting wooden warships to steam power did not work out, and an iron skin for a wooden ship did not prove successful. The British quickly learned of the advantages of an all-iron ship in terms of room and safety. Into this dramatic situation came one of the most important developments: the screw propeller. Paddle wheel ships had their line of fire obscured by the big paddle boxes. And so, Lambert says, *Gloire* was "the end of the line."

Warrior was not perfect. She was a terrible ship to steer; a situation somewhat improved later by the installation of steam-powered steering equipment. Another problem was the fouling of her bottom; she had to be hauled and cleaned every ten months to maintain her precious speed. Despite her problems, *Warrior* was the most powerful warship in the world during her first commission—she bridged the era from wood to metal fighting ships.

So much for *Warrior*'s salad days. Before going into the story of what happened to her as the years passed, we should interrupt to tell of the tragedy that befell her creator, Admiral Sir Baldwin Walker, Surveyor of the Navy. He worked through the Tory government of Lord Derby, who never liked him. But Walker's foe in the Tory government was Disraeli, who hated Walker because he blew the whistle on Disraeli during a Tory ministry 1852-1853. Lambert says "Walker's professional integrity defeated a crude Tory attempt to use the dockyards for political advantage." Disraeli never missed a chance to undermine Walker's work. Then when the Liberal government of Lord Palmerston came into power, Walker's days were numbered. Palmerston and his top politicians became instant naval experts. Walker took it for three years and resigned in 1861.

Lambert says during Walker's first ten years in office, "he created the steam battle fleet and marshalled the resources of the nation to meet the needs of war with Russia and a simultaneous naval challenge from Britain's erstwhile ally, France. By 1856 his career had reached its zenith; . . . Walker dominated British construction policy."

Despite Walker's loss to the government, his masterpiece continued on in naval service. Newer ships surpassed *Warrior* but she maintained a useful naval role. For instance, *Warrior* with *Black Prince* towed the Bermuda dock from Madeira to Bermuda, maintaining an average speed of 4.7 knots.

Warrior's active naval service ended in 1883. At Portsmouth she became a veritable hulk but a useful one because of her size and her interior room. At one point she became a depot ship for torpedo stores, serving the destroyer fleet; later she was a workshop and power house. Her closest call to possible destruction came in 1925, when she was offered for sale, but there were no takers. Ten years later she became a mooring hulk for tankers at Pembroke dock, an assignment she carried out well for 50 years. She was well cared for in this role, and because of her general condition there was talk as early as 1960 to save and restore her. In 1968 the Duke of Edinburgh called a meeting at Buckingham Palace to discuss formation of a National Maritime Trust to preserve historic ships. *Warrior* was discussed at the meeting and the Duke went to see her.

Meanwhile, *Warrior*'s fate was helped by the dramatic return of *Great Britain* from the Falklands; public interest in the ship exceeded expectations. Perhaps *Warrior* would rouse the same kind of public interest. Eventually the newly formed National Maritime Trust got *Warrior* and the Manifold Trust of England promised financial help. The ship is now owned by a subsidiary of the National Maritime Trust, as is the case with *Great Britain*. *Warrior* was taken to Hartlepool for rebuilding. Here was found a great treasure of skilled workers in need of jobs; a perfect situation for a tired old ship needing a lot of tender, loving care. *Warrior*'s story is best summed up by Lambert in his conclusion:

"*Warrior* marked the greatest single development in the history of warship design."

JOHN R. HEBERT

Spring Hill, FL

JACOBUS BOELEN, *A Merchant's Perspective: Captain Jacobus Boelen's Narrative of his Visit to Hawai'i in 1828*. Translated, with introduction and notes by Frank J. A. Broeze (Honolulu: Hawaiian Historical Society, 1988). xxxii + 117 pages, illustrations, index. $20.00.

It is difficult not to succumb to the appeal of the "Sandwich Islands" in the early nineteenth century, as the paradise revealed to the world by Cook underwent rapid transformation under various forms of

western impact. Merchant, missionary, master of trading, whaling, or naval vessel—each left his mark, and not a few wrote accounts of Hawaii in this complex and interesting era. One such record, little known outside the land of its original Dutch publication, was penned by merchant captain Jacobus Boelen. Boelen visited the islands in the WILHELMINA & MARIA during the course of a global trading voyage designed to extend the network of Dutch trade so as to include the west coast of South America with the East Indies and home. He spent six weeks at Kealakekua and Kailua Bays on Hawaii, at Honolulu, and at Waimea on Kauai; six years passed before he published in Amsterdam the three volumes of his *Voyage to the East and West Coast of South America and thence to the Sandwich and Philippine Islands, China, etc. . . .*

In this brief but interesting narrative, Frank J. A. Broeze of the University of Western Australia has extracted the four relevant chapters of volume three, added a valuable introduction and notes to his translation of the original, and produced a work which, while not altering any fundamental concept of Hawaii in the 1820s, nevertheless will stand as a permanent contribution. Broeze is uniquely qualified for this task, for in addition to his ability to work in the original Dutch (and he has combed European archives for supporting data), he is well versed in maritime and Pacific history—and into the bargain is editor of THE GREAT CIRCLE, journal of the Australian Maritime History Association.

Boelen's account in this version is only 85 pages, and a fair proportion of that contains navigational instructions. But as Broeze points out, the chapters have some unique aspects. Boelen's homeland had no political aspirations in the Sandwich Islands (one of the few seafaring nations to be able to make such a claim at the time), nor was he possessed of a single-minded missionary or naval viewpoint. A naval officer on special leave, with considerable mercantile experience, his charge was to search for commercial opportunities in general as well as for his own vessel. At least in the latter capacity he had some success, finding a contract to carry sandalwood to Canton, and then another to take tea home to Holland. He made friends and contacts quickly, not least because, as the first Dutch flag-carrier here, he was in a sense a national representative. This opportunity, coupled with his determination to record his observations and impressions, contributes to a valuable account, one moreover which was not used in the standard histories of western contact in the period such as those by R. S. Kuykendall or H. W. Bradley.

As it happened, 1828 was a particularly active year for distinguished visitors, which included the Prussian PRINZISSIN LUISE and the Russian exploration ship MÖLLER. A gala season resulted, and Boelen throws interesting light on the round of social relationships, which included a party for King Kauikeaouli. A still more daunting challenge was the reception on board his vessel of chief Kuakini, acting governor of Oahu, whose massive bulk of 470 pounds had to be hoisted aboard—only to see him fall over backward with a resounding crash once on deck. But no damage was done, and Boelen went on to record not only his association with the inhabitants of all classes, but also adding interesting detail to the story of commercial relationships in the islands, particularly those involving William French, an important early merchant who contracted Boelen's sandalwood cargo and served as his guide about the islands.

Overall, this is a worthwhile addition to the primary literature on Hawaii. Its physical format, as well, is handsome—attractive binding, wide margins, readable print—doing considerable credit to the Hawaiian Historical Association and to the University of Hawaii Press which did the actual production work. In short, it is a book worth having in any collection relating to Hawaii or 19th-century Pacific voyaging.

BRITON C. BUSCH
Colgate University

BENJAMIN B. LABAREE, *A Supplement (1971-1986) to Robert G. Albion's Naval and Maritime History, An Annotated Bibliography,* 4th edition (Mystic Seaport, 1988), VIII + 232 pages. $12.00.

It is a pleasure to welcome this fine supplement which Benjamin Labaree has produced to the fourth edition of Albion's *Naval and Maritime Bibliography* which originally appeared in 1972. It adds some 2,000 references to the more than 5,000 listed in the 1972 edition, which is some indication of how the field of naval and maritime history has increased in importance since that time.

It, like the original, lists only works written in English and is divided into some seven sections. They are reference works, merchantmen and warships, captains and crews, maritime science explorations and expan-

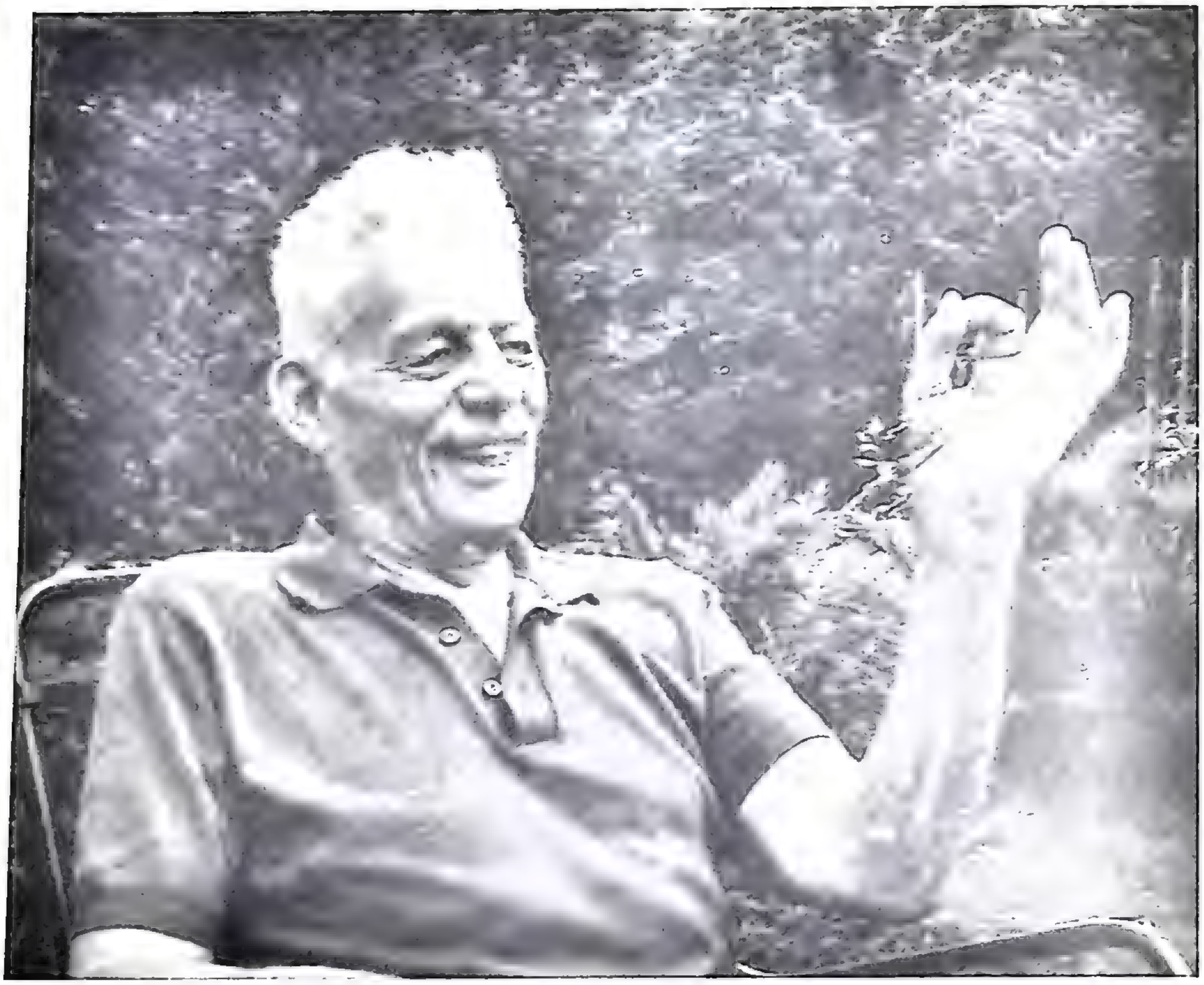
sion, commerce and shipping, navies, special topics and an index.

As one would expect from the volume of publications in recent years, this bibliography is overwhelmingly filled with listings of works concerned with United States and British naval and maritime history as well as those dealing with periods since A.D. 1500 And certainly it is true that some 90% of the worldwide books published in these fields since 1972 deal with these geographic areas and the more recent past. But it might be useful in the projected new edition which the author has promised us some four or five years hence to include more on pre-modern periods like the books recently published by Britain's National Maritime Museum for instance. It is to be hoped also that more space can be devoted to maritime museum publications in general as well. And one can also dream of a much longer section in the next revised edition on such topics as underwater archaeology and marine art. And would it not be useful to list the leading journals of naval and maritime history with something of their coverage and their value to the interested maritime specialist?

None of the above is in any sense a criticism of this fine supplement. Every naval and maritime historian or marine buff should have it at his elbow and with thanks to the author and his collaborators for their labor.

ARCHIBALD R. LEWIS

Marblehead, MA



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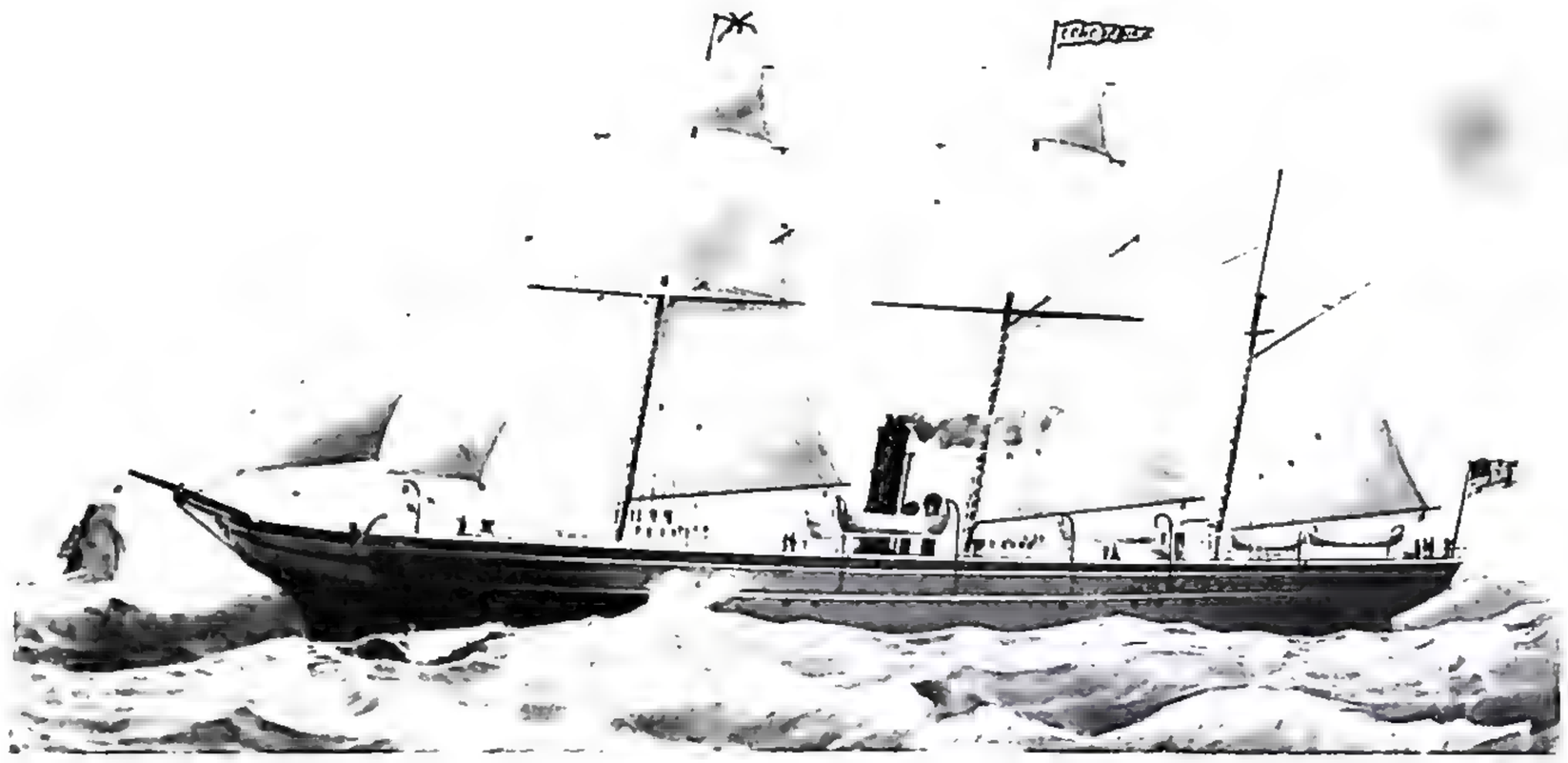

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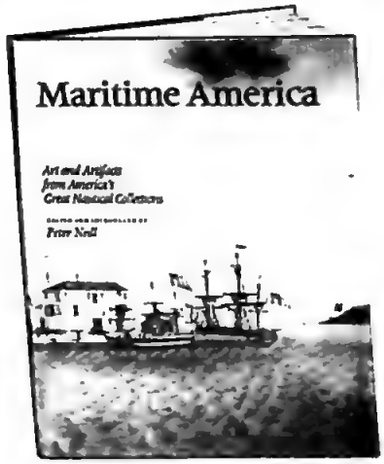

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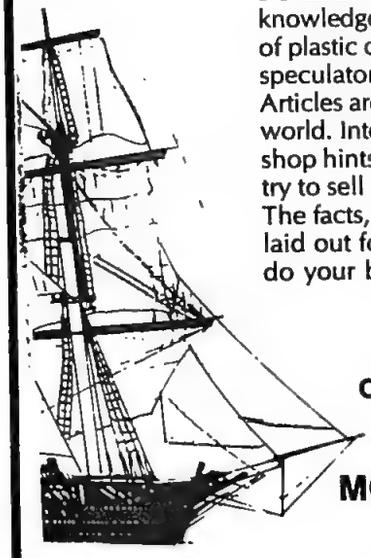

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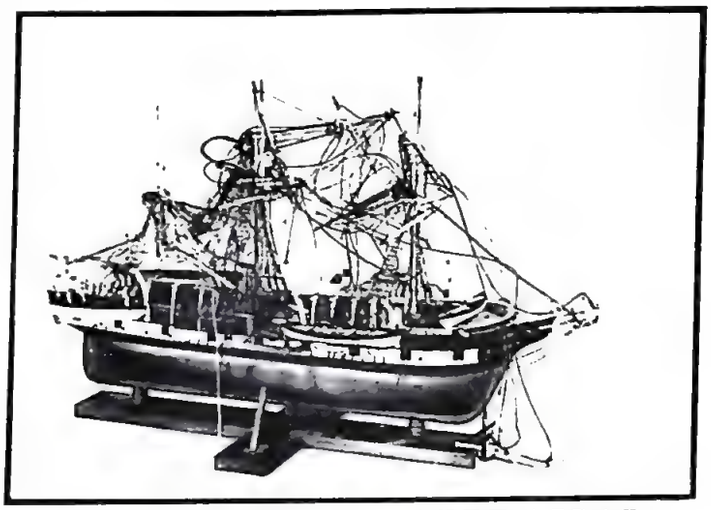

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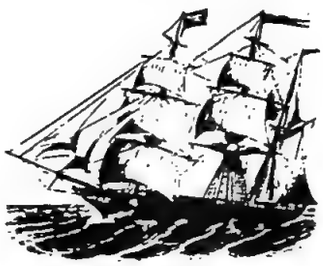

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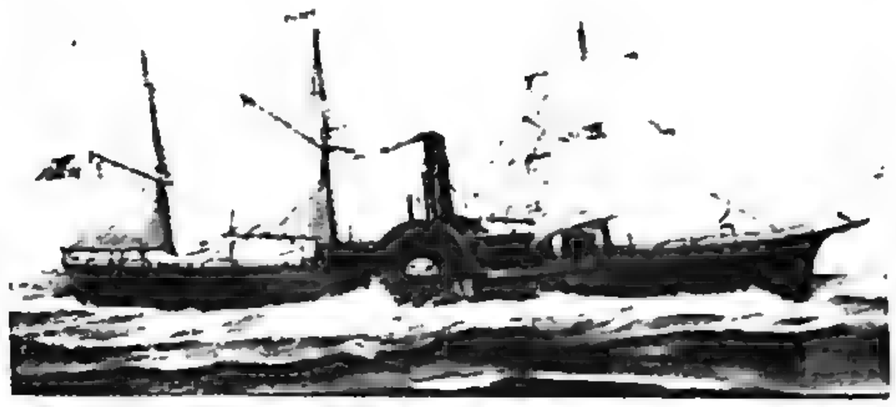

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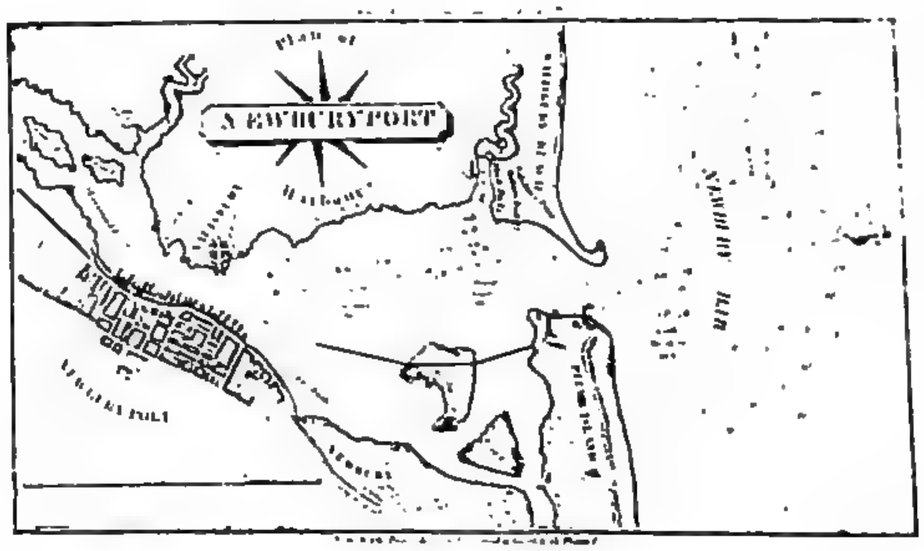

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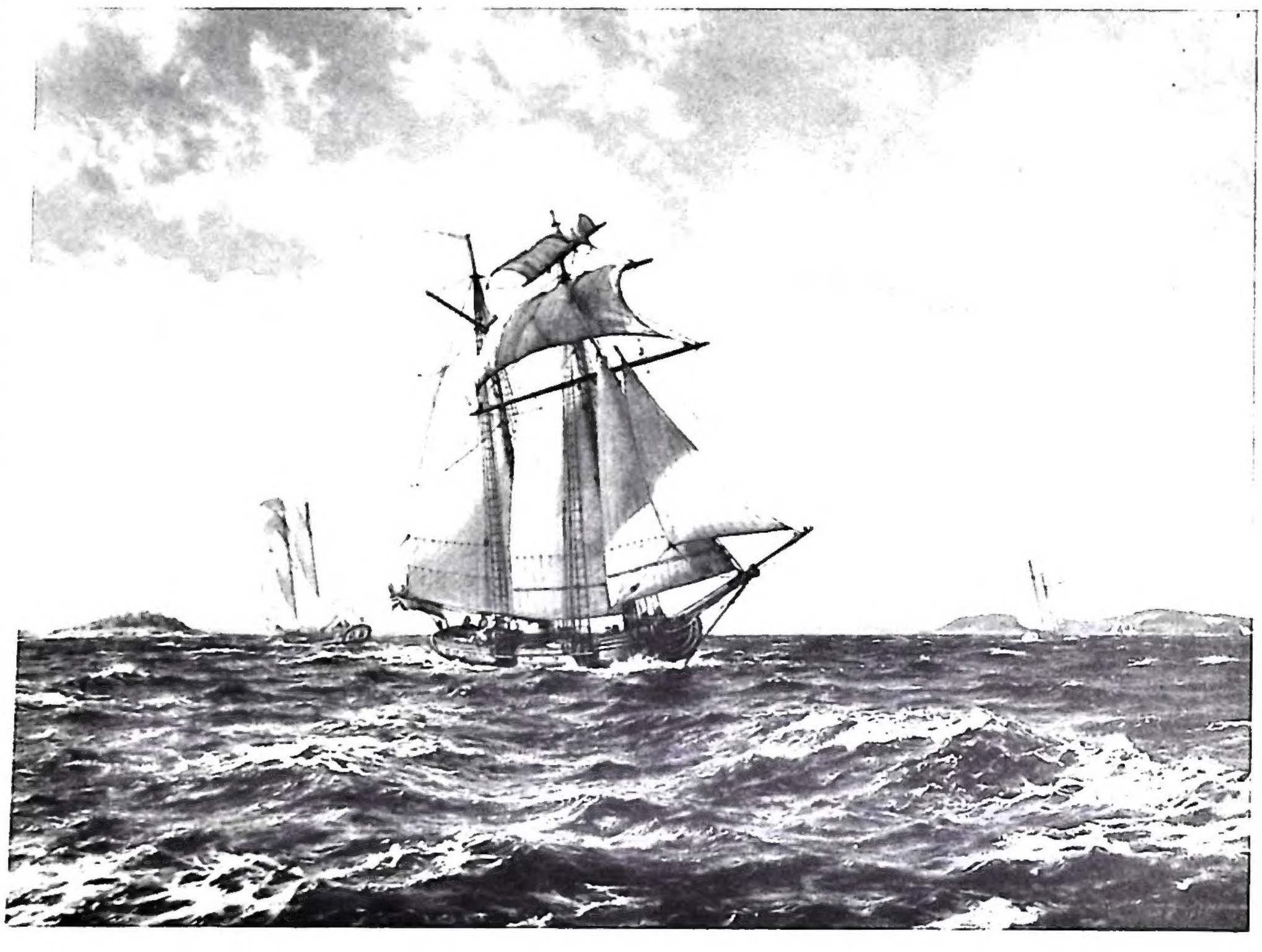

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